City of FLORENCE
SOUTH CAROLINA

DEPARTMENT OF PUBLIC WORKS AND UTILITIES

TEL: (843) 665-323
FAX: (843) 665-320

June 26, 2015

Mrs. Suzanne K. Armor
Associate Regional Counsel
United States Environmental Protection Agency
Office of Environmental Accountability
Office of Water Legal Support
61 Forsyth Street, S.W.
Atlanta, Georgia 30303

David Phillips, P.E.
Industrial Pretreatment Program Coordinator
United States Environmental Protection Agency
Municipal and Industrial Enforcement Section
EPA Region 4
61 Forsyth Street, S.W.
Atlanta, Georgia 30303

Glenn Trofatter
Bureau of Water, Director
South Carolina Department of Health and Environmental Control
Water Pollution Control
2600 Bull Street
Columbia, South Carolina 29201

RE: Timmonsville Semi-Annual Report Submittal
No. 4:13-cv-01522-RBH
November 26, 2014 through May 26, 2015

Dear Madam and Gentlemen:

In accordance with the provisions of the Consent Decree (CD), Section IX (Reporting Requirement), Paragraph 63, Pages 35-37, herewith we are transmitting the Semi-Annual Progress Report which covers the time period from November 26, 2014 through May 26, 2015.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering such information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment of knowing violations.

If you have any questions concerning this submittal, please contact me.

Sincerely,

Andrew H. Griffin,
City Manager

Enclosures

Copy: Beth Drake, US DOJ
David Wilson, SC DHEC
Elizabeth A. Dieck, SC DHEC
Darrick Jackson, Timmonsville Mayor
Eleazer Carter, Timmonsville Attorney
Jim Peterson, City of Florence Attorney
Michael Hemingway, Utilities Director
Forrest Whittington, City Engineer

Semi-Annual Progress Report

November 26, 2014 through May 26, 2015

Submitted to US EPA on June 26, 2015

Table of Content

Section 1

Consent Decree language, page 35, Paragraph 63, sub-paragraph a: *"a description of all projects conducted during the most recently completed Calendar Quarter to comply with the requirements of this Consent Decree."*

- Section VIII. WORK TO BE PERFORMED – Paragraph 53, Repair and Rehabilitation of WWTP Sand Filters – Complete
- Section VIII. WORK TO BE PERFORMED – Paragraph 54, Short-Term Management of the Holding Pond at Defendant's WWTP a and b – Complete
- Section VIII. WORK TO BE PERFORMED – Paragraph 56, Kingpin and Industrial Park sanitary sewer lift station maintenance upgrade - Complete

CDM Smith

1100 Marion Street, Suite 300
Knoxville, Tennessee 37921
tel: 865 963-4300
fax: 865 963-4301

June 24, 2015

Mr. George Bryan
Project Manager
SCDHEC – State Revolving Fund Section
Facilities Permitting Division
2600 Bull Street
Columbia, SC 29201

Subject: City of Florence – Timmonsville WWTP Filter Rehabilitation
Construction Completion Status

Dear Mr. Bryan:

This letter certifies that the above referenced project was constructed in substantial accordance with the signed and sealed contract drawings and specifications. Construction substantial completion was granted to the Contractor on December 16, 2014. If you have any questions or need any additional information, please do not hesitate to contact me.

Very truly yours,

Joshua M. Norton

Joshua M. Norton, P.E., BCEE
Vice President
CDM Smith Inc.

cc: Michael Hemingway, City of Florence

Section 2

Deliverables submitted during the Semi-Annual Period include the following:

- Submitted Revised Major Pump Stations Power Loss Evaluation (MPS-PLE)
- Submitted Revised Timmonsville WWTP Comprehensive Performance Evaluation (CPE)
- Submitted Revised Sewer Overflow Response Plan (SORP)
- Local Limits Headworks Analysis and Evaluation Report

City of Florence

Major Pump Stations Power Loss Evaluation

(MPS-PLE)

March 2015

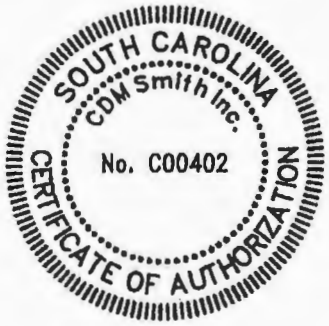
City of Florence

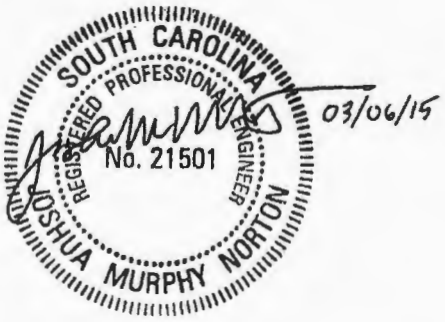
Major Pump Stations Power Loss Evaluation (MPS-PLE)

March 2015

Prepared By:

CDM Smith Inc.





I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Andrew Griffin, City Manager

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1.0 INTRODUCTION

1.1 PURPOSE

The purpose of The City of Florence's (City) Major Pump Stations Power Loss Evaluation (MPS-PLE) is to provide a comprehensive evaluation of the City's current backup power supplies, emergency procedures, and ability to prevent power outages at major pump stations across the City's sanitary sewer system (SSS). In accordance with the United States Environmental Protection Agency's (EPA) Consent Decree with the Town of Timmonsville (Town) and the City, the MPS-PLE provides an evaluation of the City's entire pump station system as well as detailed evaluations of each of the four pump stations designated as 'major' by the City's Wastewater Treatment Division. Copies of this document will be provided to all persons who are involved in meeting its objectives.

1.2 GENERAL BACKGROUND

The City's Wastewater Treatment Division is responsible for operating and maintaining 102 pump stations in the City's service area as well as 15 pump stations in the Town's service area. The Division also operates the City's 18 million gallons per day (MGD) wastewater management facility (WWMF) as well as the Town's 2 MGD wastewater treatment plant (WWTP). City pump station sizes range from pumps with less than 5 horsepower (HP) and under 100 gallons per minute (gpm) of design flow to pumps above 100 HP capable of providing up to 4,200 gpm. Major pump stations are determined based on the pump station's capacity as well as its location in the City's collection system. Major pump stations collect and transport wastewater to interceptor sewers that direct flow to the wastewater treatment plant. A change in the conditions experienced at a major pump station will therefore have a significant effect on the upstream collection system as well as the downstream operation of the WWMF.

Regular inspection of the City's pump stations is completed across three separate routes, equally divided amongst individual Wastewater Treatment Division Lift Station crews. Routine inspection checklists are followed by each crew to validate proper operation of each station. Permanent backup generators are provided at certain individual pump stations, while portable generators are available for use at other pump stations as needed during a power outage. The City also currently has emergency response procedures in place, including overflow response practices noted in the City's Sewer Overflow Response Plan (SORP) and wet weather protocols during rain events, to address any problems experienced at the City's pump stations.

1.3 DEFINITIONS AND ACRONYMS

This section is designed to define terms and acronyms used in the MPS-PLE as defined in the Clean Water Act (CWA) or in regulations promulgated under the CWA. It includes basic definitions of a pump station and SSS, thereby giving readers an overview to help understand the following sections.

1.3.1 DEFINITIONS

1. **Critical Response Time (CRT)** – shall mean the time interval between activation of the high wet well level alarm and the first sanitary sewer overflow (SSO) under peak flow conditions.

2. **Force Main** – shall mean any pipe that receives and conveys, under pressure, wastewater from the discharge side of a pump. A Force Main is intended to convey wastewater under pressure.

3. **Gravity Sewer Line** – shall mean a pipe that receives, contains, and conveys wastewater not normally under pressure, but is intended to flow unassisted under the influence of gravity. Gravity sewers are typically not intended to flow full under normal operating conditions.

4. **Major Pump Station** – shall mean a large interceptor pump station that directs wastewater flows to the WWMF. Major Pump Stations are designated as such by the City and consist of the Middle Swamp Pump Station, Police Cabin Pump Station, Steel Road Pump Station, and Williamson Road Pump Station.

5. **Pump Station** – shall mean facilities comprised of pumps which lift wastewater to a higher hydraulic elevation, including all related electrical, mechanical, and structural systems necessary to the operation of that pump station.

6. **Sanitary Sewer System (SSS)** – shall mean the municipal sanitary wastewater collection and transmission systems, including all pipes, force mains, gravity sewer lines, lift stations, pump stations, manholes and appurtenance thereto conveying wastewater to the WWTP.

7. **Wastewater Management Facility (WWMF)** – shall mean that portion of the City of Florence WWMF designed to provide treatment of municipal sewage and industrial waste and all components of such management facility.

1.3.2 ACRONYMS

1. **CRT** – Critical Response Time

2. **CWA** – Clean Water Act

3. **EPA** – United States Environmental Protection Agency

4. **MPS-PLE** – Major Pump Station Power Loss Evaluation

5. **SCADA** – Supervisory Control and Data Acquisition

6. **SORP** – Sewer Overflow Response Plan

7. **SSO** – Sanitary Sewer Overflow
8. **SSS** – Sanitary Sewer System
9. **WWMF** – Wastewater Management Facility
10. **WWTP** – Wastewater Treatment Plant

1.4 OBJECTIVES

The evaluation and recommendations set forth herein are intended to allow the City to meet the following objectives as they relate to pump station operation during a power outage:

1. Protect public health and safety;
2. Protect private and public property adjacent to the collection and treatment facilities;
3. Protect the collection system, wastewater pumping stations, wastewater treatment facilities, and all appurtenances;
4. Comply with all local, state, and federal rules and regulations; and,
5. Minimize liability.

2.0 EXISTING PUMP STATION SYSTEM EVALUATION

2.1 SYSTEM OVERVIEW

The City's Wastewater Treatment Division currently owns, operates, and maintains 102 pump stations in the City's collection system as well as 15 pump stations in the Town's collection system following the acquisition of the Town's SSS as a part of the EPA's Consent Decree. Appendix A provides information on each pump station in the City's and Town's systems, including pump horsepower and design point for the City's pump stations. Four of the City's pump stations are designated as 'major' due to their pumping capacity and/or location in the City's collection system. They are the Middle Swamp Pump Station, Police Cabin Pump Station, Steel Road Pump Station, and Williamson Road Pump Station. Due to low pumping capacities and their location within the Town's SSS, no pump stations in the Town's collection system are considered to be 'major'. Appendix B provides a map of the City's major pump stations.

This MPS-PLE will evaluate the backup power supply, emergency procedures, and ability to prevent power outages at each of the four major pump stations. The MPS-PLE will also provide a summary overview of the entire system and the City's ability to address an emergency situation at any pump station.

2.2 SYSTEM MAINTENANCE

The City's Wastewater Treatment Division Lift Station crews conduct regular inspections of the City's pump stations in accordance with the Routine Lift Station Check Sheet. A copy of the City's existing check sheet is provided in Appendix C.

Tasks included in the routine inspection vary by station location and are based on the type of pump station. Submersible lift stations in wet wells include checks of the wet well, chains, and rails as well as the pumps. Pump stations in buildings include checks of electrical controls and building equipment as well as the pumps. Smaller 'can' stations requiring confined space entry include air testing requirements in order to confirm the safety of personnel prior to entry. Onsite generators are to be checked and tested on a monthly basis.

In each case, any necessary maintenance is to be completed at the time of inspection if the task is minor. If the required maintenance requires additional tools, equipment, or personnel, the maintenance items are to be submitted into the City's electronic work order system for processing.

A proposed check sheet with additional electrical-related preventative maintenance checks, as recommended in the discussion of corrective measures in Section 4, is also included in Appendix C.

2.3 EMERGENCY NOTIFICATION

The City's four major pump stations each have Supervisory Control and Data Acquisition (SCADA) systems installed with remote communication capability to the WWMF in the event of an emergency. Other pump stations throughout the City's system are in the process of obtaining SCADA systems as well. Through the use of the SCADA system, Wastewater Treatment Division personnel at the WWMF can remotely monitor each major pump station for proper operation and can respond to any alarm situations as they occur. It is also the practice of the City to provide all pump stations with an audible and/or visual alarm to allow the general public to notify the City of any emergency situation involving a pump station.

2.4 BACKUP POWER

The Wastewater Treatment Division utilizes both permanent and portable generators across their system in case of a power outage. Of the four major pump stations, the Middle Swamp and Williamson Road Pump Stations are each equipped with permanent generators. The Adams Branch and Black Creek Pump Stations are also equipped with permanent generators but are not classified as major pump stations by the City. The City also owns a total of eight portable generators specifically for use by the Wastewater Treatment Division at the WWMF and any pump station in the system. Five additional portable generators are assigned to the City's Water Division but are compatible with the pump stations in the wastewater system and can be used in the event of an emergency. As shown in the table below, the generators assigned to the Middle Swamp, Police Cabin, and Williamson Road pump stations are capable of operating each station at their rated capacity, as well as operate all ancillary equipment and instrumentation. However, the generator assigned to the Steel Road Pump Station is not capable of operating the station at its peak power demand. Generator connection compatibility of each pump station in the City's system is provided in Appendix A and a summary of the Wastewater Treatment Division's Pump Station Generator List, including connection compatibility and supply capacity, is provided in Appendix D.

Generator Supply Capability				
Pump Station Name	**Peak Power Demand (kW)**	**Generator Supply Capacity, Apparent Power (kVA)**	**Generator Supply Capacity, Real Power (kW)**	**Generator Type**
Middle Swamp	110	250	200	Onsite
Police Cabin	135	331	265	Large Portable
Steel Road	195	62.5	50	Portable
Williamson Road	130	331	265	Onsite

2.5 EMERGENCY PUMPING CAPABILITIES

The Wastewater Treatment Division owns four portable pumps for use in an emergency pumping situation in which all pumps are inoperable and/or backup power to the station is not available. The pumps can be rapidly connected to each major pump station at a quick-connection location for suction and discharge. The portable pumps include a 400 gpm pump, an 800 gpm pump and two 1200 gpm pumps. Each 1200 gpm capacity pump meets the estimated peak flow of three of

the four major pump stations, but does not meet the peak flow of the Middle Swamp Pump Station.

2.6 LIGHTNING PROTECTION

All pump stations in the City's system, including each of the four major pump stations, have equipment in place to protect against lightning strikes. All pumps stations are equipped with an electrical service grounding system and surge protective devices on the incoming power and the power supply in the control panels. The electrical service grounding system is designed, in accordance with National Electrical Code requirements, to provide an effective path to ground for surges, spikes and lightning. The surge protective devices are used to help protect and safeguard equipment against damaging electrical surges and spikes from the incoming electrical service, as well as those caused by lightning. Detailed information about the protective devices present at each of the City's major pump stations is provided in Section 3.

2.7 EMERGENCY RESPONSE PROCEDURES

The emergency response to a problem at one of the City's pump stations follows the general outline described herein.

1. The Pump Station Operator will assess the situation to the best of his/her ability and obtain help if necessary. If the general public identifies an emergency situation, they can dial the emergency numbers posted on each pump station:

   - WWMF Office – (843) 665-3240
   - Police Dispatch – (843) 665-3191

   Pump stations connected into the City's SCADA system will automatically display information regarding an emergency situation at the WWTP control room.

2. After an initial assessment by the Pump Station Operator, if additional assistance is required, the Pump Station Operator shall call the WWMF Superintendent to obtain the necessary resources to correct the problem(s) and return the pump station to normal operation.

3. In the event the pump station incident causes a Sanitary Sewer Overflow (SSO) situation, the following steps shall be taken:

   - By-pass pumping is instituted until the incident is resolved and the pump station is operating normally;

   - Additional personnel assistance is received from the Collection Operations Division;

   - Clean-up of the affected area is completed to control potential contamination and the entire area is disinfected with pellet lime; and,

- An initial assessment of the cause of the problem as well as a determination on how to prevent future incidents from occurring is conducted.

Additional discussion regarding the proper procedures to be followed in the event of a SSO is provided in the City's SORP, current edition.

4. Completed work orders of the incident are submitted by staff detailing the corrective actions and a final assessment of the cause of the incident is completed by the WWMF Superintendent.

2.8 WET WEATHER PROCEDURES

During wet weather events, Wastewater Treatment Division Lift Station crews on each shift visit the major pump stations to monitor for normal operation and any increase in flow. The inspecting crew shall report any changes in flow to the WWMF staff in order to allow for operational adjustments within the plant to ensure effective wastewater treatment throughout the wet weather event.

2.9 PUMP STATION CRITICAL RESPONSE TIMES

The City's Utilities Department has established a standard for Wastewater Treatment Division personnel to respond to and assess a pump station emergency. During normal business hours the City has set the goal to respond to and assess a pump station emergency, at any pump station within the City's SSS, in less than one hour. During non-business hours (after-hours, weekends, holidays), the response goal is set to 90 minutes for each of the four major pump stations and two hours for all other pump stations with the City's SSS.

Critical Response Times (CRT) for each major pump station were determined using peak flow rates. The peaking factor used to determine the peak flow rate for each major pump station was calculated from flow monitoring data obtained during a two month period in 2012. The flow monitoring period experienced lower than average rainfall and therefore may not accurately reflect year-round rainfall data. To account for this potential inaccuracy, each major pump station's calculated peaking factor was compared to a standard peaking factor of 2.5, as established by state design criteria. The higher and therefore more conservative peaking factor was utilized for each major pump station in order to provide an estimated worst-case peak flow condition. CRTs, peaking factors, and peak flow rates are provided for each major pump station in Section 3.

2.10 SSO HISTORY

From November 2008 through November 2013 the City experienced a total of 50 SSOs as a result of problems experienced at a pump station in the City's SSS. Of the 50 pump station-related SSOs, 16 can be attributed to emergency equipment failures, power outages, or lightning strikes. A summary examination of the SSOs, analyzed by cause and timeline, is provided below.

SSO Metrics			
Cause of SSO	**# of Events**	**Estimated Total Volume (gal.)**	**Median Volume per Event (gal.)**
Pump Failure	5	14,700	500
Debris/Grease	7	48,670	750
Internal Electrical Failure	18	259,150	3,450
Electrical Service Outage	8	24,740	2,475
Lightning/Electrical Storm	8	26,100	3,250
Miscellaneous	4	46,500	500

SSO Trends Analysis		
Year	**# of Events**	**Estimated Total Volume (gal.)**
Nov 25, 2008 – Nov 24, 2009	16	180,260
Nov 25, 2009 – Nov 24, 2010	15	167,950
Nov 25, 2010 – Nov 24, 2011	4	23,200
Nov 25, 2011 – Nov 24, 2012	8	21,000
Nov 25, 2012 – Nov 24, 2013	7	27,450

An analysis of the SSO metrics provided above shows that the most common issue resulting in a pump station related SSO was an internal electrical failure. These failures typically involved some combination of the main circuit breaker, control panel, and the mercury float switches. It is also noted that SSOs resulting from any type of electrical-related outage resulted in a significantly higher median SSO volume than SSOs caused by non-electrical-related SSOs. An analysis of the five-year SSO trends shows significant improvement, beginning in 2011, in the total number and volume of SSOs experienced by the City. This improvement is expected to continue as the City implements the various pump station corrective actions noted in Section 4. Additional information regarding each pump station-related SSO in the last five (5) years is also provided in Appendix E.

3.0 MAJOR PUMP STATION EVALUATIONS

3.1 MIDDLE SWAMP PUMP STATION

The Middle Swamp Pump Station is located in the southern portion of the City's service area on Pamplico Highway between US 301 and Middle Swamp. The station currently contains three pumps, each driven by 70 HP motors and housed in an 11-foot by 12-foot rectangular precast concrete wet well. The existing pumps each operate at a design point of 1,250 gpm at 85 feet of head and discharge into an 18-inch diameter force main. Influent flows average approximately 900 gpm with peak flows of 2,260 gpm recorded during wet weather events.

Since 2014 an emergency generator has been permanently installed on the pump station property and will automatically provide power to the pumps during a power outage through an automatic transfer switch. In the event of a complete pump station failure, including all pumps and the emergency generator, Wastewater Treatment Division personnel will respond to the site and initiate onsite bypass pumping with portable pumps. A bypass pump connection to the force main is available with quick-connection capabilities. With an estimated peak flow at the Middle Swamp Pump Station of 2260 gpm the largest portable pump owned by the City's Wastewater Treatment Division, with a pumping capability of 1200 gpm, may not be able to meet the influent flow demand. Although this deficiency is highly unlikely due to the presence of the permanent generator and automatic transfer switch, a complete pump station failure requiring the use of emergency bypass pumping will result in the need for crews to examine the upstream gravity system for any SSO conditions until the pump station returns to normal operation.

The pump station has a SCADA system installed onsite to allow for remote monitoring of the pump station by WWMF personnel. The SCADA system will also transmit alarm situations, including primary power outages, high-water levels, pump failures, and generator failures, to various WWMF personnel. An auditory and visual alarm will also activate during an emergency situation, allowing the general public or Wastewater Treatment Division personnel performing wet weather inspections to notify the City of an alarm situation.

Based on a peaking factor of 2.5, in accordance with state design criteria, the CRT for the Middle Swamp Pump Station is one hour and twenty minutes from the initial activation of the high-water alarm. Wastewater Treatment Division personnel must be alerted to the alarm condition, reach the site, assess the emergency situation, and either remedy the situation or begin emergency bypass pumping within the critical response timeframe in order to avoid an SSO condition.

Equipment to protect against lightning strikes is installed at the pump station site and includes an electrical service grounding system and surge protective devices on the incoming power and the control panel power supply. The control panel surge protective device has a Surge Current Rating per phase of 200,000 Amps peak and a Voltage Protection Rating of 1200 Volts. Installation of the surge protective device occurred as a part of overall pump station improvements completed in mid-2014. The protective measures

now in place will help mitigate damage to onsite equipment caused by electrical surges and lightning and will improve the overall reliability of the station during such events.

No deficiencies requiring corrective measures have been identified for the Middle Swamp Pump Station. The existence of a permanent generator, automatic transfer switch, and SCADA monitoring will significantly reduce the potential for any SSO condition at the pump station.

3.2 POLICE CABIN PUMP STATION

The Police Cabin Pump Station is located in the northern portion of the City's service area on McIver Road near High Hill Creek. The station currently contains two pumps, each driven by 47 HP motors and housed in a 10-foot diameter precast concrete wet well. The existing pumps each operate at a design point of 820 gpm at 119 feet of head and discharge into a 12-inch diameter force main. Influent flows average approximately 220 gpm with peak flows of 800 gpm recorded during wet weather events.

Although an emergency generator is not currently installed at the pump station, a connection for one of the City's large portable generators is available in order to provide backup power during an outage. In the event of a complete pump station failure involving both pumps, Wastewater Treatment Division personnel will respond to the site and attempt to operate the pump station through the use of a portable generator. If the portable generator does not alleviate the emergency situation, the responding crew will initiate onsite bypass pumping with portable pumps. A bypass pump connection to the force main is available with quick-connection capabilities. With an estimated peak flow at the Police Cabin Pump Station of 800 gpm the largest portable pump owned by the City's Wastewater Treatment Division, with a pumping capability of 1200 gpm, will be able to meet the influent flow demand experienced at the pump station without the threat of an upstream SSO condition.

The pump station has a SCADA system installed onsite to allow for remote monitoring of the pump station by WWMF personnel. The SCADA system will also transmit alarm situations, including primary power outages, high-water levels, pump failures, and generator failures, to various WWMF personnel. An auditory and visual alarm will also activate during an emergency situation, allowing the general public or Wastewater Treatment Division personnel performing wet weather inspections to notify the City of an alarm situation.

Based on a peaking factor of 3.6, as determined from flow monitoring data, the CRT for the Police Cabin Pump Station is three hours from the initial activation of the high-water alarm. Wastewater Treatment Division personnel must be alerted to the alarm condition, reach the site, assess the emergency situation, and either remedy the situation or begin emergency bypass pumping within the critical response timeframe in order to avoid an SSO condition.

Equipment to protect against lightning strikes is installed at the pump station site and includes an electrical service grounding system and surge protective devices on the incoming power and the control panel power supply. The control panel surge protective

device has a Surge Current Rating per phase of 200,000 Amps peak and a Voltage Protection Rating of 1500 Volts. Installation of the surge protective device occurred in January 2014. The protective measures now in place will help mitigate damage to onsite equipment caused by electrical surges and lightning and will improve the overall reliability of the station during such events.

No deficiencies requiring corrective measures have been identified for the Police Cabin Pump Station. The existence of SCADA monitoring in conjunction with a three hour CRT will significantly reduce the potential for any SSO condition at the pump station.

3.3 STEEL ROAD PUMP STATION

The Steel Road Pump Station is located in the eastern portion of the City's service area on Steel Road between US 76 and US 301. The station currently contains three pumps, each driven by 60 HP motors and housed in a 10-foot by 20-foot rectangular precast concrete wet well. The existing pumps each operate at a design point of 1,500 gpm at 89 feet of head and discharge into a 16-inch diameter force main. Influent flows average approximately 270 gpm with estimated peak flows of 680 gpm during wet weather events.

Although an emergency generator is not currently installed at the pump station, a connection for one of the City's portable generators is available in order to provide limited backup power during an outage. In the event of a complete pump station failure involving all pumps, Wastewater Treatment Division personnel will respond to the site and attempt to operate the pump station through the use of a portable generator. As noted in Section 2.4, the supply capacity of the portable generator assigned to the station does not allow the station to operate at its peak power demand. If the portable generator does not alleviate the emergency situation, the responding crew will initiate onsite bypass pumping with portable pumps. A bypass pump connection to the force main is available with quick-connection capabilities. With an estimated peak flow at the Steel Road Pump Station of 680 gpm the largest portable pump owned by the City's Wastewater Treatment Division, with a pumping capability of 1200 gpm, will be able to meet the influent flow demand experienced at the pump station without the threat of an upstream SSO condition.

The pump station has a SCADA system installed onsite to allow for remote monitoring of the pump station by WWMF personnel. The SCADA system will also transmit alarm situations, including primary power outages, high-water levels, pump failures, and generator failures, to various WWMF personnel. An auditory and visual alarm will also activate during an emergency situation, allowing the general public or Wastewater Treatment Division personnel performing wet weather inspections to notify the City of an alarm situation.

Based on a peaking factor of 2.5, in accordance with state design criteria, the CRT for the Steel Road Pump Station is fifty minutes from the initial activation of the high-water alarm. Wastewater Treatment Division personnel must be alerted to the alarm condition, reach the site, assess the emergency situation, and either remedy the situation or begin emergency bypass pumping within the critical response timeframe in order to avoid an SSO condition.

Because the CRT is less than the City's anticipated response times, it is imperative that Wastewater Treatment Division personnel respond to any alarm situations at the Steel Road Pump Station as expeditiously as possible. Additional efforts, to include increased inspections of the pump station during wet weather events, will aid in reducing the possibility of an SSO condition at the pump station.

Equipment to protect against lightning strikes is installed at the pump station site and includes an electrical service grounding system and surge protective devices on the incoming power and the control panel power supply. The control panel surge protective device has a Surge Current Rating per phase of 200,000 Amps peak and a Voltage Protection Rating of 1500 Volts. Installation of the surge protective device occurred in May 2014. The protective measures now in place will help mitigate damage to onsite equipment caused by electrical surges and lightning and will improve the overall reliability of the station during such events.

Due to the lack of a permanent generator and automatic transfer switch, the inadequate capacity of the portable generator assigned to the pump station, and the inadequate CRT available for Wastewater Treatment Division personnel to respond to an alarm situation at the pump station, the Steel Road Pump Station is deficient in its ability to avoid SSO conditions during emergency situations. This deficiency will require corrective measures in order to meet the standards set forth by the EPA. The City shall equip the pump station with a permanent generator and automatic transfer switch in order to reduce the potential for an SSO condition. The permanent generator and automatic transfer switch shall be installed onsite by November 2015.

3.4 WILLIAMSON ROAD (TWO MILE CREEK) PUMP STATION

The Williamson Road Pump Station is located in the eastern portion of the City's service area on Williamson Road near Two Mile Creek. The station currently contains two pumps, each driven by 130 HP motors and housed in a 10-foot diameter precast concrete wet well. The existing pumps each operate at a design point of 1,308 gpm at 102 feet of head and discharge into a 12-inch diameter force main. Influent flows average approximately 320 gpm, with peak flows of 800 gpm recorded during wet weather events.

While an emergency generator is permanently installed on the pump station property, it does not automatically provide power to the pumps during a power outage due to the lack of an automatic transfer switch. Wastewater Treatment Division Lift Station crew personnel must manually initiate operation of the generator for use until primary power is restored to the pump station site. In the event of a complete pump station failure involving both pumps, Wastewater Treatment Division personnel will respond to the site. If operation of the emergency backup generator is not possible or it does not alleviate the emergency situation, responding personnel shall initiate onsite bypass pumping with portable pumps. A bypass pump connection to the force main is available with quick-connection capabilities. With an estimated peak flow at the Williamson Road Pump Station of 800 gpm the largest portable pump owned by the City's Wastewater Treatment Division, with a pumping capability of

1200 gpm, will be able to meet the influent flow demand experienced at the pump station without the threat of an upstream SSO condition.

The pump station has a SCADA system installed onsite to allow for remote monitoring of the pump station by WWMF personnel. The SCADA system will also transmit alarm situations, including primary power outages, high-water levels, pump failures, and generator failures, to various WWMF personnel. An auditory and visual alarm will also activate during an emergency situation, allowing the general public or Wastewater Treatment Division personnel performing wet weather inspections to notify the City of an alarm situation.

Based on a peaking factor of 2.5, in accordance with state design criteria, the critical response time for the Williamson Road Pump Station is one hour and thirty minutes from the initial activation of the high-water alarm. Wastewater Treatment Division personnel must be alerted to the alarm condition, reach the site, assess the emergency situation, and either remedy the situation or begin emergency bypass pumping within the critical response timeframe in order to avoid an SSO condition. Because the CRT matches the City's anticipated response time during non-working hours, Wastewater Treatment Division personnel must be able to respond to any alarm situations at the Williamson Road Pump Station as expeditiously as possible.

Equipment to protect against lightning strikes is installed at the pump station site and includes an electrical service grounding system and surge protective devices on the incoming power and the control panel power supply. The control panel surge protective device has a Surge Current Rating per phase of 200,000 Amps peak and a Voltage Protection Rating of 1500 Volts. Installation of the surge protective device occurred in January 2014. The protective measures now in place will help mitigate damage to onsite equipment caused by electrical surges and lightning and will improve the overall reliability of the station during such events.

Due to the lack of an automatic transfer switch for the permanent generator in conjunction with the limited CRT available for Wastewater Treatment Division personnel to respond to an alarm situation at the pump station, the Williamson Road Pump Station is deficient in its ability to avoid SSO conditions during emergency situations. This deficiency will require corrective measures in order to meet the standards set forth by the EPA. The City shall equip the pump station with an automatic transfer switch for the permanent generator in order to reduce the potential for an SSO condition. The automatic transfer switch shall be installed onsite by November 2015.

4.0 EVALUATION SUMMARY

4.1 OVERVIEW

Major Pump Station Summary				
	Middle Swamp PS	**Police Cabin PS**	**Steel Road PS**	**Williamson Road (Two Mile Creek) PS**
Backup Power Availability	Permanent generator with automatic transfer switch	Connection to large portable generator	Connection to portable generator; generator supply capacity less than pump station peak power demand	Permanent generator without automatic transfer switch
Emergency Pumping Capability	Bypass pump quick connection; peak flows exceed pump capacity	Bypass pump quick connection	Bypass pump quick connection	Bypass pump quick connection
Emergency Notification	SCADA System	SCADA System	SCADA System	SCADA System
Critical Response Time Analysis	1 hour 20 min; meets City's anticipated working hours response time	3 hours; meets all of City's anticipated response times	50 min; does not meet City's anticipated response times	1 hour 30 min; meets all of City's anticipated response times
Lightning Protection	Electrical service grounding system and surge protective devices	Electrical service grounding system and surge protective devices	Electrical service grounding system and surge protective devices	Electrical service grounding system and surge protective devices
Deficiency	None	None	Unlikely to meet CRT due to lack of permanent backup power; portable generator unlikely to meet pump station peak power demand	Possible inability to meet CRT due to lack of automatic transfer switch
Corrective Measure	None	None	Install permanent generator with automatic transfer switch	Install automatic transfer switch for use with permanent generator already onsite.
Schedule of Implementation	N/A	N/A	November 2015	November 2015

Overall, the City of Florence's Wastewater Treatment Division is well equipped to respond to a power outage at each of their four major pump stations. The SCADA systems installed at each pump station allow for real-time monitoring of pump operations as well as the ability to respond to emergency situations as they occur. A minimum of two pumps at each major pump station allows for pump station operations to continue if one pump is offline due to a partial power loss or due to regular maintenance. While flows into the pump station would need to be closely monitored when only one pump is available in order to ensure that influent flows do not exceed the maximum pumping capacity of the station, overall operation will not be compromised. If needed due to the failure of all pumps at a station, bypass pump connections, with the ability to

rapidly connect a portable pump, are installed at each pump station and will allow for continued emergency management of influent flows during a power outage.

Permanent generators are currently installed at two of the four major pump stations, with automatic transfer switches included at one of the four stations. The combination of a permanent generator and an automatic transfer switch allows for automatic access to the backup power provided by the generator in the event of a power outage and minimizes the potential for a pump station failure or SSO condition. The pump stations without permanent generators and/or automatic transfer switches will continue to require a timely response by Lift Station crews in the event of a power outage.

Although the City is well equipped in most areas to respond to a power outage at a major pump station, corrective measures at the Steel Road and Williamson Road Pump Stations are required to address certain deficiencies. The installation of a permanent generator and automatic transfer switch at the Steel Road Pump Station will significantly reduce the possibility of an SSO condition due to a power outage. The installation of an automatic transfer switch at the Williamson Road Pump Station, for use in conjunction with the permanent generator already onsite, will immediately improve its power loss response capabilities. These corrective measures must be completed, in accordance with the EPA Consent Decree, by November 2015.

In addition to the corrective measures required at two of the City's major pump stations, other improvements to the City's overall pump station system will assist in decreasing the number of SSOs resulting from a power outage. Along with the 85 pump stations with a permanent generator, M80 portable generator connection, or S22 portable generator connection, there are 32 pump stations with "other" or unknown generator connections. The number of pump stations with unknown generator connections includes 14 of the 15 Town pump stations, now under the operation of the City in accordance with the EPA Consent Decree. It is recommended that the City determine and define the type of generator connection at each pump station in order to ensure that a compatible portable generator is available for use in the event of an emergency. This recommended corrective measure should be completed by November 2015.

Additionally, the inclusion of electrical-related preventative maintenance checks at each pump station in the SSS, as discussed in Appendix C, will help reduce the number of SSOs resulting from internal electrical failures. This recommended corrective measure should be implemented as a part of the routine maintenance performed by City personnel by May 2015.

Lastly, in order to ensure that this MPS-PLE accurately reflects the current operation of the City's SSS and pump stations, Wastewater Treatment Division personnel are to, on an annual basis, review and update this MPS-PLE with any changes to the pump station system.

APPENDIX A: CITY OF FLORENCE PUMP STATION LISTING

City of Florence Pump Stations			
Pump Station Name	**Motor HP**	**Design Point**	**Generator Connector Type**
I-20 – Dozier Boulevard	5	200 gpm @ 33'	S22
76 Liftstation	20	700 gpm @ 66'	S22
Adams Branch	90	4200 gpm @ 94.7'	Onsite Generator
Alligator Road	4.7	170 gpm @ 40'	S22
Black Creek	160	4200 gpm @ 143.6'	Onsite Generator
Blitsgel/Traces	5	80 gpm @ 46'	S22
Brandon Woods	5	180 gpm @ 47'	S22
Calvin	3	150 gpm @ 28'	S22
Campground	20	630 gpm @ 44'	S22
Carolina Bank	3	100 gpm @ 22'	S22
Carver	2	100 gpm @ 18'	S22
Cashua Street	10	500 gpm @ 37'	S22
Celebration Square	7.5	350 gpm @ 22'	S22
Charters	5	100 gpm @ 48'	Other
Chase Street	18	700 gpm @ 47.1'	S22
Clement Street	5	185 gpm @ 25'	Other
Cloisters	10	350 gpm @ 44'	S22
Corbett Place	2	100 gpm @ 22'	S22
Country Club West Palmetto	14.8	500 gpm @ 52'	S22
Country Club of SC	10	200 gpm @ 60'	S22
Crownland	3.4	150 gpm @ 20'	S22
Curry Lane	5	180 gpm @ 47'	S22
Darlington Highway (Murphy's)	7.5	150 gpm @ 25'	Other
Dewey Carter School	10	200 gpm @ 60'	S22
Ebenezer Chase	10	200 gpm @ 60'	Other
Ebenezer Road IGA	5	120 gpm @ 45'	S22
Effingham Detention Center	20	630 gpm @ 44'	S22
Fairground	35	1000 gpm @ 54'	S22
Ferguson	5	390 gpm @ 32'	S22
Florence Baptist Temple	6.5	300 gpm @ 44'	S22
Florence-Darlington Tech	15	500 gpm @ 66'	M80
Foxcroft Subdivision	3	300 gpm @ 22'	Other
Foxfire	2	80 gpm @ 13'	S22
FM Forest Subdivision	5	185 gpm @ 25'	S22
FMU – Gate #3	20	630 gpm @ 44'	S22
FMU – Gate #5	3	150 gpm @ 20'	S22
Green Acres	15	350 gpm @ 66'	S22
Harmony Street	2	100 gpm @ 22'	S22
Harriett	10	350 gpm @ 61'	S22
Highway 301 North	48	1200 gpm @ 78'	S22
Hoffmeyer	5	127 gpm @ 31.5'	Other
Ingram	5	100 gpm @ 30'	S22
James Turner Road	10	200 gpm @ 27'	S22
Jody Road	2	90 gpm @ 20'	Other
Kings Gate	10	200 gpm @ 27'	S22
Lakeshore	20	630 gpm @ 44'	S22
Lakewood	6.5	300 gpm @ 44'	S22
Magnolia Trace	3	170 gpm @ 62'	S22

APPENDIX A: CITY OF FLORENCE PUMP STATION LISTING (CONT.)

Pump Station Name	Motor HP	Design Point	Generator Connector Type
Mars Hill	3	156 gpm @ 30'	Other
Mays Place	2	100 gpm @ 22'	S22
McCall Farms	10	135 gpm @ 42'	S22
McLeod Hospital	5	150 gpm @ 37'	S22
McCracken	10	250 gpm @ 60'	S22
Meadows	7.5	350 gpm @ 22'	S22
Middle Swamp	70	1250 gpm @ 85'	Onsite Generator
Oak Pointe	3	100 gpm @ 33'	S22
Oakdale Terrace	5	127 gpm @ 31.5'	Other
Panton	5	100 gpm @ 44'	S22
Paper Mill Road	30	500 gpm @ 44'	S22
Pelican	33	200 gpm @ 115'	S22
Peninsula	2	125 gpm @ 32'	Other
Pine Forest	5	275 gpm @ 45'	S22
Pine Lake	10	200 gpm @ 27'	S22
Pineneedles	3	127 gpm @ 27'	S22
Police Cabin	47	820 gpm @ 119'	M80
Public Works	10	200 gpm @ 60'	S22
Quail Pointe	7.5	140 gpm @ 42'	S22
Quinby	47	820 gpm @ 119'	M80
QVC	7.5	140 gpm @ 42'	S22
Rest Area	20	500 gpm @ 32'	S22
Richmond Hills	20	500 gpm @ 32'	S22
Roche-Carolina	60	1000 gpm @ 105'	S22
Rosedale	3	127 gpm @ 27'	Other
S & W Manufacturing	7.5	200 gpm @ 45'	S22
Sandstone	10	200 gpm @ 60'	S22
Sopkins	7.5	150 gpm @ 50'	Other
Southbrook	15	500 gpm @ 49'	S22
Southern Pines	1	30 gpm @ 20'	Other
Stanley Drive	10	214 gpm @ 85.6'	S22
Steel Road	60	1500 gpm @ 89'	S22
Summergate	20	500 gpm @ 32'	S22
Tara Village	5	150 gpm @ 37'	Other
Tennis Center	10	350 gpm @ 44'	S22
Theodore Lester	5	100 gpm @ 45'	S22
Timrod Park	14	350 gpm @ 66'	S22
Tree Top Inn	4.7	156 gpm @ 30'	Other
Villa Arno	5	150 gpm @ 37'	S22
Vintage Place	10	200 gpm @ 60'	S22
Wedgewood	5	127 gpm @ 31.5'	S22
Whitehall	5	150 gpm @ 37'	S22
Wild Bird Lane	10	275 gpm @ 55'	S22
Williams Heights	5	150 gpm @ 37'	S22
Williams School	14.8	350 gpm @ 66'	S22
Williamson Road (Two Mile Creek)	130	1308 gpm @ 102'	Onsite Generator
Wilson High School	5	150 gpm @ 37'	Other
Windsor Forest	3	156 gpm @ 30'	S22
Wisteria	2	120 gpm @ 20'	S22

APPENDIX A: CITY OF FLORENCE PUMP STATION LISTING (CONT.)

Pump Station Name	Motor HP	Design Point	Generator Connector Type
Womack Gardens	20	500 gpm @ 58'	S22
Woodmont	3	156 gpm @ 30'	S22
Wrenwood	4.7	156 gpm @ 30'	S22
YMCA	3	300 gpm @ 21'	Other
Yopps	3	156 gpm @ 30'	Other

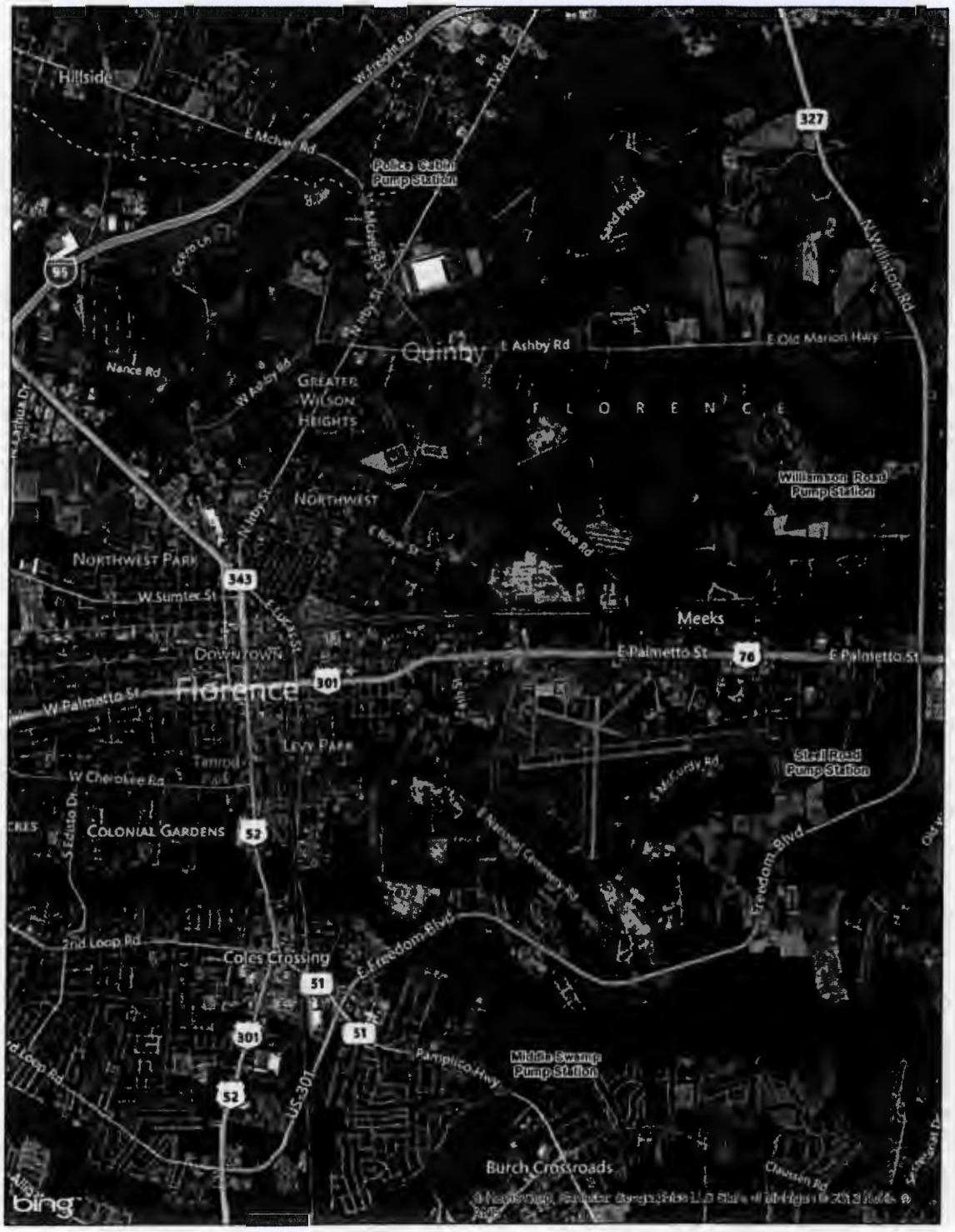
Note: See Appendix D, Pump Station Generator List, for corresponding portable generator connector information.

Town of Timmonsville Pump Stations			
Pump Station Name	**# of Pumps**	**Design Flow per Pump**	**Invert Size (in.)**
Budget	2	170 gpm	10
Darlington	2	100 gpm	8
Hondaway	2	250 gpm	10
Hwy 403	2	120 gpm	12
Industrial Park	2	175 gpm	12
Kemper Street	2	120 gpm	10
Kingpin	2	110 gpm	6
Main Street	2	500 gpm	10
Mashack	2	175 gpm	12
Sand Spur	2	120 gpm	8
Sparrow Swamp[1,2]	3	2,140 gpm	18
Timmons Road (Campground)	2	100 gpm	10
Vanda Drive	2	80 gpm	8
White Street	2	120 gpm	6
Young Road	2	80 gpm	8

Notes:

1. Sparrow Swamp PS is located directly adjacent to the Town of Timmonsville WWTP and is considered to be the Influent PS for the WWTP.
2. Sparrow Swamp PS has an onsite permanent generator.

APPENDIX B: MAJOR PUMP STATIONS MAP



APPENDIX C: ROUTINE LIFT STATION CHECK SHEETS

Existing Check Sheet

CAN STATION (NON-PERMIT SPACES):

- Test air; do not enter if abnormal readings are detected
- Check exhaust fans
- Check sump pump
- Check gate valves and discharge valves
- Check seals
- Check pumps and motors for temperature and vibrations
- Check wet well levels and air pumps

SUBMERSIBLE LIFT STATION WITH PUMP AND MOTORS IN WET WELL:

- Check to see if power is at station
- Check alarms – Horn, Buzzer, and/or Lights
- Check Level Control System/Devices – float balls, transducers, etc.
- Check to make sure pumps are pumping and seated
- Check to make sure electrical controls are working properly
- Check to make sure wet well, chains, and rails are in good condition
- Check wet well for grease and trash
- Check fence for limbs and damage
- Check to make sure wet well, electric panel, and gates are locked and area is clean

STATION INSIDE BUILDING:

- Check to see if power is at station
- Check alarms – Horn, Buzzer, and/or Lights
- Check Level Control System/Devices – float balls, transducers, etc.
- Check to make sure pumps are pumping
- Check to make sure electrical controls are working properly
- Check oil and belts or drive shaft and sump pump
- Check exhaust fans
- Grease regularly

ALL LIFT STATIONS:

- Perform maintenance on items noted or write up work orders as needed
- Onsite generators shall be checked and tested once per month

Proposed Check Sheet

CAN STATION (NON-PERMIT SPACES):

- Test air; do not enter if abnormal readings are detected
- Check exhaust fans
- Check sump pump
- Check gate valves and discharge valves
- Check seals
- Check pumps and motors for temperature and vibrations
- Check wet well levels and air pumps

SUBMERSIBLE LIFT STATION WITH PUMP AND MOTORS IN WET WELL:

- Check to see if power is at station
- Check alarms – Horn, Buzzer, and/or Lights
- Check Level Control System/Devices – float balls, transducers, etc.
- Check to make sure pumps are pumping and seated
- Check to make sure electrical controls are working properly
- Check to make sure wet well, chains, and rails are in good condition
- Check wet well for grease and trash
- Check fence for limbs and damage
- Check to make sure wet well, electric panel, and gates are locked and area is clean

STATION INSIDE BUILDING:

- Check to see if power is at station
- Check alarms – Horn, Buzzer, and/or Lights
- Check Level Control System/Devices – float balls, transducers, etc.
- Check to make sure pumps are pumping
- Check to make sure electrical controls are working properly
- Check oil and belts or drive shaft and sump pump
- Check exhaust fans
- Grease regularly

ALL LIFT STATIONS (GENERAL):

- Perform maintenance on items noted or write up work orders as needed
- Onsite generators shall be checked and tested once per month

ALL LIFT STATIONS (ELECTRICAL):

- Complete quarterly checks of electrical terminations
- Confirm station electrical gear is grounded properly
- Check equipment voltage on each phase
- Check and record amp draw on pumps
- Inspect panel and associated electrical devices for evidence of overheating
- Confirm applicable spare relays and fuses are available
- Check interior of panel for moisture buildup; confirm desiccant is installed in panel

APPENDIX D: PUMP STATION GENERATOR LIST

Equipment #	Equipment Description	Generator Connector Type	Generator Supply Capacity, Real Power (kW)
784	Detroit Diesel Large Portable Generator	M80	265
785	Detroit Diesel Large Portable Generator	M80	265
786	Detroit Diesel Large Portable Generator	M80	265
770	Onan Portable Generator	S22	50
771	Onan Portable Generator	S22	15
772	Onan Portable Generator	S22	15
773	Onan Portable Generator	S22	15
EFF	Effingham Portable Generator	Other	20
ABLS	Adams Branch P.S. Onsite Generator	Permanent	300
BCLS	Black Creek P.S. Onsite Generator	Permanent	200
MSLS	Middle Swamp P.S. Onsite Generator	Permanent	200
WRLS	Williamson Road P.S. Onsite Generator	Permanent	265

Note: Five additional portable generators are assigned to the City's Water Division but are compatible with the pump stations in the wastewater system and can be used in the event of an emergency.

APPENDIX E: SSO HISTORY, NOVEMBER 2008 – NOVEMBER 2013

A complete listing of pump station-related SSOs within the previous five (5) years of the effective date of the EPA's Consent Decree follows. SSOs resulting from an emergency equipment failure, power outage, or lightning strike are highlighted.

Date of SSO	Location of SSO (pump station, manhole or line)	Estimated Volume of the SSO (gallons)	Cause of SSO (grease, blockage, I&I, loss of pump station power, pump station failure or other)	Corrective Action to Stop SSO	Corrective Action to Prevent Future SSOs
3/1/2009	4009 E. Palmetto St.	9,000	One of the pumps at our Hwy. 301 pump station tripped out causing the gravity line to back up with flow that was not being removed from the line. This occurred after the area received 2 7" rain which allowed portions of our collection to take on access water while being submerged.	Pump station operator got the pumps operating.	Pump station operator called electrician to check the control panel to ensure normal operation was occurring.
3/4/2009	1175 Hannah Drive	200	Both pumps at the Pine Forrest pump station tripped out.	Pump station operator responded to the call.	Operator called electrician to check the control panel operating system.
3/5/2009	1175 Hannah Drive	500	Both pumps at the Pine Forrest pump station tripped out.	Pump station operator responded to the call.	Operator called electrician to check the control panel operating system and contacted contractor to meet with their electrician due to this being a new pump station accepted approximately three weeks prior.
3/7/2009	1821 S. Mauldin Dr.	20	Pumps were clogged with grease.	Pump station operator responded to the call.	Operators pulled both pumps and broke up the large deposits of grease within the pump station wet well.
6/5/2009	2000 Block Pamplico Highway	18,000	Blown fuse on the main breaker.	Pump station operator responded to the call and called an electrician.	Replaced blown fuse on the main breaker with a new one.
6/6/2009	1600 E. Williamson Road	12,000	#18 wire for the mercury sensor system broken at terminal within electrical control panel.	Pump station operator responded to the call and called an electrician.	Called electrician to trouble the control panel within the station to diagnose the situation. A broken terminal wire was found within the electrical control panel, which prevented the pumps from operating correctly in automatic mode.
6/16/2009	2000 Block Pamplico Highway	90,000	Blown fuse on the main breaker.	Pump station operator called electrican.	Replaced blown fuse on the main breaker with a new one and electrical staff investigated the situation to try and identify what is causing the blown fuse to occur.
6/17/2009	266 W. McIver Road	39,000	Pumps were clogged with rags and other large debris.	Pump station operator responded to the call.	Operators pulled pumps from wet well and removed rags and other debris from volute section of the pumps.
6/20/2009	2000 Block Pamplico Highway	3,500	Breaker in control panel tripped out and would not allow pumps to engage.	Pump station operator called electrican.	Operator called on-call electrician to trace the electrical problem. Electrician staff found burnt wires within the control panel impacts proper operation of the transducer and high level alarm system.
7/4/2009	350 Fairhaven Road	300	Mercury switch went bad at the down stream pump station.	Pump station operator called electrican.	Operator placed pump in hand operation mode and pump the station wet well down. Then called electrician to check the multiple mercury switches and changed bad mercury switch.
7/20/2009	301 LFT STA	less than 500	lift station problem	Called pump station operator.	Pump station monitored the pump station for normal operation.
7/30/2009	2000 Block Pamplico Highway	3,500	Electrical storm caused main breaker to fail.	Operator reset main breaker.	Operator called electrician to check electrical components within the control panel.
8/6/2009	3500 E. Palmetto St.	300	Fuse blown for main breaker.	Pump station operator called electrican.	Electrician replaced blown fuse and reset breaker control parameters.
8/31/2009	1600 E. Williamson Road	1,200	Phase monitor burnt out in electrical control panel.	Upon arrival operator assessed the problem and installed back up phase monitor kept onsite within the electrical control panel.	Called electrician to trouble shoot the electrical control panel.
9/9/2009	2000 Block Pine Needles Road	2,000	Electrical control breaker at our Pine Needles pump station tripped out.	Pump station operator called electrican.	Electrician checked electrical control breaker and reset to operating conditions.
11/21/2009	4104 W. Pelican Lane	240	Electrical power supply failure on Pee Dee Electrical side.	Electrician checked electrical supply & called Pee Dee Electric. Maintenance & Electrical operators brought portable generators and ran station until Pee Dee Electric restored power.	Pee Dee Electric restored power to the pump station.
12/26/2009	4937 S. Irby St.	50	Mercury switch was not operating properly.	Pump station operator called electrican.	Replaced mercury switch and placed pump in normal operation.
1/8/2010	305 Magna Carta Road	less than 500	lift station off	Pump station operator responded to the call.	Pump station operator monitored the station for normal operation.
1/25/2010	266 W. McIver Road	3,500	Two mercury switches were inoperative.	Pump station operator called electrican.	Operator switched pumps to hand operation and pumped down the wet well. Electricians then came and installed new mercury switches.
3/30/2010	6331 E. Palmetto Street	3,700	One of the jack legs was out on the transformer on the supply line to the pump station from Progress Energy.	Pump station operator responded to the call and called Progress Energy.	Progress Energy technician placed jack leg back into proper position and power supply resumed to the pump station.
4/21/2010	1600 E. Williamson Road	45,000	Discharge piping split leaving the pump station.	Pump station operator turned off pump station until repair completed.	City crews replaced a 3' section of discharge piping and installed two new repair clamps.
4/22/2010	Lester School	less than 500	lift station not working	Pump station operator responded to the call.	Pump station operator and utility operation crew vacuumed excess grease from pump station wet well.
5/26/2010	1600 E. Williamson Road	700	Mercury switch stuck with grease from collection system.	Pump station operator responded to the call.	Operator pump wet well down and removed all residual grease from the wet well.
6/3/2010	266 W. McIver Road	1,500	Phase monitor was inoperable.	Pump station operator responded to the call.	Operator called electricians who came and installed a new phase monitor.
6/27/2010	266 W. McIver Road	4,500	Electrical storm hit station and caused a power surge within the phase monitor.	2nd Shift operator responded to the call.	Operator called electricians who came and installed a new phase monitor and reset control panel.
7/1/2010	2000 Block Pamplico Highway	3,900	Transducer starting to fail electronically.	Pump station operator called electrican.	Called electrician to calibrate unit and check operating parameters. Also, ordered a new unit to be installed.
7/10/2010	1600 E. Williamson Road	3,000	Electrical storm disrupted power supply.	Operated on-site emergency generator until power was restored by Progress Energy.	No Action Necessary

Date of SSO	Location of SSO (pump station, manhole or line)	Estimated Volume of the SSO (gallons)	Cause of SSO (grease, blockage, I&I, loss of pump station power, pump station failure or other)	Corrective Action to Stop SSO	Corrective Action to Prevent Future SSOs
7/26/2010	1600 E. Williamson Road	600	Electrical storm hit the Progress Energy line providing service to our pump station and caused a disrupted of power supply to the station.	Upon arrival inspection station would not operate. Called on-call electrician who instructed him how to turn on the on-site emergency generator and ran the emergency generator for two and one-half hours while Progress Energy completed their repair work.	No Action Necessary
8/13/2010	905 Whitehall Shores	less than 500	Floatballs hung up in station and prevented pumps from operating normally.	Pump station operator identified the problem, pulled up float balls and untangled floatballs.	
9/30/2010	1000 Block Becky's Pkwy	50,000	Main breaker for the electrical control panel burnt out.	Electrician jumpered out the main breaker until a new one could be obtained from the electrical supply house.	
9/30/2010	1600 E. Williamson Road	50,000	Electrical relay was inoperative inside the electrical control panel.	Electrician installed a new electrical relay upon arrival to the station.	
3/3/2011	3117 W. Palmetto St.	less than 500	Rags & debris cased the downstream sewage pump station to have an electrical overload preventing both pumps from operating.	Collection system crew responded to the call and notified pump station operators to check the first downstream sewage pump station.	
6/11/2011	3117 W. Palmetto St.	1,800	Elevated ampere usage by the pumps caused the thermal overloads to malfunction and not allow the pumps to operate continuously.	Electrical staff replaced both thermal overloads in the electrical control panel of the pump stations.	
7/22/2011	903 Rice Planters	5,900	Both pumps at the Pine Needles pump station were clogged with rags and debris preventing the pumps from pumping sewage.	Operators removed rags and debris from both pump stations and returned stations to normal operation condition.	
8/29/2011	1600 E. Williamson Road	15,000	Electrical breakers were tripped in the electrical control panel at the pump station.	The maintenance operator found the problem when passing the station and immediately stopped and reset the electrical control for both pumps in the station.	
12/30/2011	1600 E. Williamson Road	3,400	High level alarm mercury switch became inoperable	The effected area was raked to remove debris and solids and pellet lime was spread for disinfection and odor control in the area adjacent to the water body.	
5/17/2012	1600 E. Williamson Road	3,500	Both soft start inverters tripped due to lightning storm. Extremely severe storm with 3 - 6 " rain	The effected area was raked to remove debris and solids and pellet lime was spread for disinfection and odor control in the area adjacent to the water body.	
6/8/2012	2000 Block Pine Needles Road	1,800	Both pumps at Pine Needles pump station tripped due to rags/trash	The area was raked to remove visible solids and pellet lime was spread for odor control and disinfection.	
7/2/2012	3728 N. Williston Rd.	less than 500	Severe wind storm on 7/1/2012 resulted in power outage of Eastern Florence including this lift station and down stream station Hwy 301.	The area was raked to remove visible solids and pellet lime was spread for odor control and disinfection.	
7/2/2012	103 Easterling Circle, Quinby	800 gallons	Severe wind storm on 7/1/2012 resulted in power outage of Eastern Florence including this lift station. Power restored on 7/3/12 - 8:00 am	The area was raked to remove visible solids and pellet lime was spread for odor control and disinfection.	
7/10/2012	Williamson Road	3000 gallons	Lightning in area tripped control breaker to station	The area was raked to remove visible solids and pellet lime was spread for odor control and disinfection.	
7/22/2012	301 Pump Station	800 gallons	Control fuses and phase monitor blown out, probably due to power surge.	City electrician replaced the fuses and monitor and restarted the pumps. Cleaned up and spread lime pellets on the affected area.	
9/7/2012	Middle Swamp lift station	7200 gallons	The pump control panel was tripped due to lightning storm. Severe lightning and heavy rain (2.25")	The area was raked to remove visible solids and pellet lime was spread for odor control and disinfection.	
12/21/2012	Williamson Road	4050 gallons	Progress Energy lost power to the station due to phase loss on their supply line (tripped breakers on power lines)	The area was raked to remove visible solids and pellet lime was spread for odor control and disinfection.	
1/6/2013	Williamson Road	1350 gallons	Progress Energy lost power to the station due to phase loss on their supply line (tripped breakers on power lines)	The area was raked to remove visible solids and pellet lime was spread for odor control and disinfection.	
2/26/2013	2000 Pamplico Hwy	10500 gallons	Progress Energy lost power to the liftstation due to severe weather that damaged a main power feeder to a large area of Florence - possible tornado	The area was raked to remove visible solids and pellet lime was spread for odor control and disinfection.	
5/1/2013	2000 Pamplico Hwy	750 gallons	Heavy rain storms with 3.9" of rain created a major inflow into collection system causing a heavy demand on the pumping system with excessive quantities of debris partially clogging the pumps.	WW operator checked the LS for problems and found that the station was pumping but not keeping up. The operator immediately called for help and pulled the pumps and cleaned the rags & debris from the pumps allowing the pumps to maintain a working level.	
8/11/2013	1600 East Williamson Rd	2700 gallons	Float ball switch failed; would not turn pumps on to run	The area was raked to remove visible solids and pellet lime was spread for odor control and disinfection.	
8/19/2013	266 West McIver Road	4500 gallons	Wet well level was high due to heavy rainfall and one of two pumps had failed. One pump was not enough to keep the wetwell level down and mainhole overflowed.	The area was raked to remove visible solids and pellet lime was spread for odor control and disinfection.	
9/27/2013	5227 E. Palmetto St.	3600 gallons	On a routine inspection, WW operator found that electrical power feeding the station wetwell was out and station was overflowing.	Operator contacted Duke Power and electrician on call. Duke restored power and the operator pumped the station down. The area was raked to remove visible debris and solids and pellet lime was spread for odor control and disinfection.	

CDM Smith

1441 Main Street, Suite 1000
Columbia, South Carolina 29201
tel: 803 758-4500
fax: 803 771-6665

March 6, 2015

Mr. Maurice L. Horsey, IV, Chief
Municipal and Industrial Enforcement Section
NPDES Permitting and Enforcement Branch
United States Environmental Protection Agency – Region 4
Atlanta Federal Center
61 Forsyth Street
Atlanta, GA 30303

Subject: Major Pump Stations Power Loss Evaluation Resubmittal & Response to EPA Comments
Town of Timmonsville and City of Florence Consent Decree
Civil Action No.: 4:13-cv-01522-RBH

Dear Mr. Horsey:

On behalf of the City of Florence (City), CDM Smith has reviewed the comments dated January 20, 2015 provided by the U.S. Environmental Protection Agency Region 4 (EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC) regarding the Major Pump Stations Power Loss Evaluation (MPS-PLE) originally submitted by the City in November 2014.

The City and CDM Smith have prepared a revised MPS-PLE in response to your comments, as requested. A summary of the revisions for each of the comments is as follows:

1. Generator Capacity – New information has been added to Section 2.4 confirming that all generators meet their pump station's power demands with the exception of the Steel Road Pump Station. The peak power demand (kW) for each major pump station as well as the corresponding generator supply capacity, provided in apparent (kVA) and real (kW) power, is listed in a table at the end of the section. Discussion of the Steel Road Pump Station generator deficiency has also been added to Sections 3.3 and 4.1. Real power generator supply capacities for each generator owned by the City are also provided in Appendix D as a reference.

2. Bypass Pumps – The City of Florence has recently purchased a second 1,200 gpm bypass pump in order to provide greater bypass pumping reliability throughout the system. Discussion of the additional pump has been added to Section 2.5.

   The installation of a second quick-connect location at the Middle Swamp PS was determined not to be a necessary corrective action however, and installation is not scheduled for implementation by the City at this time. After evaluating the ability of the Middle Swamp PS to provide pumping capability in the event of loss of electrical service to the station, the City believes that the lack of sufficient bypass pumping capability is not a deficiency requiring a corrective action. Installation of the onsite permanent generator and automatic transfer switch provides adequate back-up station operability to avoid an SSO condition during a power outage.

3. Lightning Protection Devices – Additional information on the surge protective devices installed at each major pump station has been added to the evaluation of each pump station in Section 3.

The information provided includes Surge Current Ratings, Voltage Protection Ratings, and installation dates for each device.

4. Peak Flow Factors – Annual data for average or above-average rainfall in the City of Florence area which could be determined to be as reliable as the two months of data collected in 2012 was not readily available. The combination of data collected and analyzed in the Florence service area along with the use of SCDHEC standard (R.61-67.300.A.11) peak flow factors ensured a conservative estimate of peak flow rates through the selection of the higher value for each pump station. It is noted that the data collected followed a logical trend in which the larger pump stations with higher average daily flows experienced lower peak flow factors, while the smaller pump stations experienced higher factors.

   Discussion of the calculation of Critical Response Times (CRT) in Section 2.9 has also been revised to better clarify the process used to determine an accurate, but conservative, peak flow factor for each major pump station.

5. Pump Station Response Time – The City has considered the current pump station response times and is committed to obtaining a 1.5 hour response time for major pump stations during non-business hours. The updated response time for the pump stations in the City's SSS is as follows:

   - Major Pump Stations
     - Working Hours: 1 hour
     - Non-Working Hours: 1.5 hours
   - All Other Pump Stations
     - Working Hours: 1 hour
     - Non-Working Hours: 2 hours

   Discussion of the revised response time is provided in Section 2.9. Changes to the evaluation of the Williamson Road Pump Station, based on the updated response time, are provided in Section 3.4 and in the summary table in Section 4.1.

   It is also noted that the City typically provides faster response times to the major pump stations than to non-major pump stations and routinely responds in a period of time that is significantly less than the official response time goals. The purpose of the CRT evaluation, however, is to examine the City's official response time goals against each pump station's CRT as a worst-case scenario.

6a. Automatic Transfer Switch – The presumption that the Automatic Transfer Switch (ATS) noted in the discussion of the Middle Swamp Pump Station was installed prior to February 2013 is incorrect. The ATS and onsite permanent back-up generator were installed in 2014 as a part of improvements at the pump station. This timeline has been added to Section 3.1 for clarity. As noted in the MPS-PLE, installation of an ATS must be completed at the Williamson Road Pump Station in order to ensure the same level of reliable on-site back-up power.

CDM Smith

6b. Electrical Related Checks – Discussion of additional electrical-related preventative maintenance checks was added to Section 2.2, with a reference to additional corrective measures noted in Section 4 for the entire Sanitary Sewer System (SSS). Appendix C was revised to include the existing Routine Lift Station Check Sheet as well as a proposed check sheet with several additional electrical-related checks. Discussion of the additional checks in Section 4 includes a deadline for implementation of this corrective measure by May 2015.

6c. SSO Evaluation – An evaluation of the SSO History provided in Appendix E has been added to Section 2.10. SSO analyses were conducted by Cause of SSO and by Calendar Year. These metrics allowed for an analysis of the leading SSO causes as well as an evaluation of the trend in the number and volume of SSOs over the 5-year reporting period. Tables displaying the data as well as discussion of the results of the data are included. In conjunction with comment #6b a corrective action intended to reduce the number of SSOs resulting from an internal electrical failure at a pump station has been added to Section 4.

7. Town of Timmonsville Pump Stations – Based on the established criteria used in determining a 'major' pump station, no pump stations within the Town's system are considered to be 'major' at this time. Information to this effect has been added to Section 2.1. Additional information on the Town's pump stations has been collected, however, and was added to Appendix A. While the Sparrow Swamp Pump Station would appear to qualify as a major pump station, its location directly adjacent to the WWTP and its function as the treatment plant's influent pump station preclude its classification as a major pump station. Any improvements required for the Sparrow Swamp Pump Station will be addressed through the Consent Decree requirements related to the Comprehensive Performance Evaluation and Composite Correction Plan.

It is also noted that all Town of Timmonsville pump stations have been upgraded to operate with two properly-sized and functioning pumps, per the requirements of the Consent Decree.

If you have any questions or comments concerning the enclosed information, please feel free to contact me at (865) 963-4371.

Sincerely,

Joshua M Norton

Joshua Norton, P.E.
CDM Smith Inc.

cc: Mr. Drew Griffin, City of Florence
Mr. Michael Hemingway, City of Florence
Mr. David Phillips, EPA Region 4
Mr. Glenn Trofatter, SCDHEC
File

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

FORREST/MICHE/

APR 1 4 2015

CERTIFIED MAIL 7010 1060 0002 1703 8341
RETURN RECEIPT REQUESTED

Mr. Drew Griffin
Manager, City of Florence
324 West Evans Street
Florence, South Carolina 29501-3456

Re: Major Pump Stations Power Loss Evaluation Resubmittal & Response to EPA Comments
Town of Timmonsville and City of Florence Consent Decree
Civil Action No.: 4:13-cv-01522-RBH

Dear Mr. Griffin:

The U.S. Environmental Protection Agency Region 4 and the South Carolina Department of Health and Environmental Control (SC DHEC) have reviewed the Major Pump Stations Power Loss Evaluation (MPS-PLE) resubmittal and response to EPA comments submitted by the City of Florence on March 11, 2015, pursuant to Subparagraph 58(b) of the referenced Consent Decree.

After consultation with the SC DHEC, the EPA is today approving this resubmittal including the routine use of preventative maintenance check items proposed in Appendix C. Please contact Mr. David Phillips at (404) 562-9773 or via email at phillips.david@epa.gov, if you have any questions.

Sincerely,

Maurice L. Horsey, IV, Chief
Municipal and Industrial Enforcement Section
NPDES Permitting and Enforcement Branch

cc: See attached mailing list

City of FLORENCE
SOUTH CAROLINA

DEPARTMENT OF PUBLIC WORKS AND UTILITIE

TEL: (843) 665-323
FAX: (843) 665-320

January 20, 2015

Mrs. Suzanne K. Armor
United States Environmental Protection Agency-Region 4
61 Forsyth Street
Atlanta, GA 30303

Subject: Comprehensive Performance Evaluation Resubmittal and Response to EPA Comments
Town of Timmonsville and City of Florence Consent Decree
Civil Action No.: 4:13-cv-01522-RBH

Dear Mrs. Armor:

The City of Florence and CDM Smith has reviewed the comments dated November 3, 2014 provided by the U.S. Environmental Protection Agency Region 4 (EPA) and the South Carolina Department of Health and Environmental Control (SC DHEC) regarding the Comprehensive Performance Evaluation originally submitted by the City on February 20, 2014.

If you have any questions or comments concerning the enclosed information, please feel free to contact Michael Hemingway at (843) 665-3236.

Sincerely,

Andrew H. Griffin
City Manager

Cc: David Phillips, EPA Region 4
Glen Trofatter, SC DHEC
Michael Hemingway, City of Florence
Joshua Norton, CDM Smith

COMPREHENSIVE PERFORMANCE EVALUATION

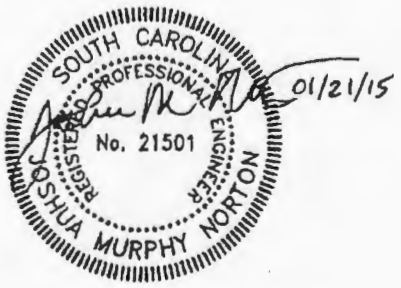
For

The Town of Timmonsville
Wastewater Treatment Plant

Date: Revised January 2015

Prepared By:

CDM Smith Inc.



I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Andrew H. Griffin, City Manager

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Section 1
Introduction

Section VIII.57 of the Consent Decree (CD) requires the City of Florence (City) to complete a Comprehensive Performance Evaluation (CPE) Program for the Town of Timmonsville Wastewater Treatment Plant (WWTP). Pertinent CD language describing the CPE is provided below.

"The purpose of the CPE is to identify flow and/or loading rate restricted treatment process unit(s) at the WWTP that limit the WWTP's ability to comply with permit requirements. The CPE shall also evaluate the cause of any effluent limit violation occurring at the WWTP since transfer of ownership of the WWTP, pursuant to Paragraph 20. The CPE shall include an in-depth diagnostic evaluation of the capacity and operation of the WWTP in terms of its ability to meet all terms of the Permit. The CPE shall employ flow modeling and/or other appropriate techniques to evaluate WWTP operations. The CPE shall also identify the flow that the WWTP may take without experiencing a Prohibited Bypass. The CPE shall establish procedures that Defendant will use to prepare a Comprehensive Correction Plan (CCP), as set forth below, based on the results of the CPE. Defendant shall propose, as part of its CPE, a schedule for submission of a CCP for the WWTP, provided, that such schedule shall not exceed six (6) Months after EPA approval of CPE. To the extent applicable, the CPE shall be consistent with the EPA publications "Improving WWTP Performance Using the Composite Correction Approach," EPA CERI, October 1984, and "Retrofitting WWTPs," EPA CERI, July 1989."

This report summarizes the CPE evaluation and presents the performance limitations of the WWTP including the WWTP's ability to meet effluent limits. It should be noted that the CPE did not evaluate the cause of any effluent limit violation occurring at the WWTP since transfer of ownership of the WWTP since transfer of ownership did not occur until after completion of this report. CDM Smith is not aware of any violations, other than the historical violations as described herein, prior to finalizing the CPE.

1.1 Related Consent Decree Programs

This CPE is consistent with other programs that are being developed to comply with the CD, specifically the Composite Correction Plan (CCP). This program is described below:

Composite Correction Plan (CCP) – The CCP is the performance improvement phase that follows the CPE. It is a systematic approach to implementing administrative, operational, and maintenance improvements as well as rehabilitation and/or upgrades to the WWTPs to address the problems, if any, identified in the CPE. The CCP will also be consistent with the EPA publications "Improving WWTP Performance Using the Composite Correction Approach" - EPA CERI, October 1984 and "Retrofitting WWTPs" - EPA CERI, July 1989; to the extent applicable. The CCP will: (A) address all factors which limit or which could limit the WWTP's operating efficiency or the ability to achieve NPDES Permit compliance; (B) address the peak flow handling procedures and peak flow capacity of the WWTP; and (C) identify specific actions and schedules to correct each limiting factor, including capital improvements to the existing WWTP where appropriate. The CCP will evaluate all appropriate alternatives and provide schedules for achieving permit compliance. [Ref. CD Section VIII.57.(b)]

The CPE will establish the treatment capacities and current flow and loading conditions to be included in the CCP.

1.2 Permit Compliance Issues

In addition to addressing the WWTP's ability to meet effluent limits, the CPE specifically shall identify the flow that the WWTP may take without experiencing a Prohibited Bypass.

Bypasses may be an issue during peak wet-weather flow conditions or treatment facility process malfunctions. Bypass language from the currently applicable WWTP's National Pollutant Discharge Elimination System (NPDES) Permit is provided below:

"a. Definitions

(1) "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

(2) "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypass not exceeding limitations.

The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Paragraphs c. and d. of this subsection.

c. Notice

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.

(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in Section D. Subsection 8 (24-hour notice).

d. Prohibition of bypass

(1) Bypass is prohibited, and the Director may take enforcement action against a permittee for bypass, unless:

(a) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance; and

(c) The permittee submitted notices as required under Paragraph c. of this subsection.

(2) The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above in Paragraph d.(1) of this subsection."

Bypass language reference from the CD consistent with the NPDES permit language above is defined as:

"Bypass" shall have "the meaning set forth at 40 C.F.R. § 122.41(m)." Under 40 C.F.R. 122.41(m)(l)(i), a "Prohibited Bypass" means "the intentional diversion of waste streams from any portion of a treatment facility. A bypass is prohibited unless:

(A) Bypass was *unavoidable to prevent* loss of life, personal injury or *severe property damage* ("severe property damage" is defined under 40 C.F.R. § 122.41(m)(l)(ii) as "substantial physical damage to property, *damage to treatment facilities which causes them to become inoperable*, or substantial and permanent loss of natural resources, which can reasonably be expected to occur in the absence of a bypass");

(B) There were *no feasible alternatives* to the bypass, such as use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

(C) The permittee submitted notices as required under Section IX of the CD (Permittee must comply with the 24-hour reporting requirements of 122.41(1)(6).)"

Prior to the conveyance of the WWTP to the City of Florence, a temporary pumping system had been installed and periodically operated to Bypass excess wet-weather flows around the sand filters. Repair and rehabilitation of the WWTP sand filters is a required CD milestone. Following the successful rehabilitation of the sand filters, the temporary Bypass pumping equipment and piping will be removed from the WWTP. The WWTP has no permanent means to allow Bypass of waste streams from any portion of the treatment facility.

1.3 CPE Process Overview

The CPE process is a detailed, systematic process for identifying current WWTP performance limiting factors that impact current NPDES Permit compliance. The process features several classification processes for rating plants based on major unit processes and for prioritizing performance-limiting factors (typically operations, maintenance, or administration factors). The CD requires the CPE to be completed in accordance with the EPA documents identified previously in this section. Key elements are summarized below.

Evaluation of Major Unit Processes

Type 1 WWTP – CPE indicates performance problems (or potential performance problems) are not a result of unit process capacities, but are related to operation, maintenance, administration, or to facility problems that can be corrected with minor modifications.

Type 2 WWTP – CPE indicates performance problems may be related to marginal capacity of one or more major unit processes; major facility modifications are likely required.

Type 3 WWTP – CPE indicates one or more major unit processes does not have sufficient capacity; major modifications or facility replacement may be required.

Prioritization of Performance Limiting Factors

A Rating – CPE indicates major performance effect on long-term, repetitive basis.

B Rating – CPE indicates minimum performance effect on routine basis, or major effect on a periodic basis.

C Rating – CPE indicates minor performance effect.

There is also a points allocation system for rating individual unit process capabilities (aeration and filtration). The process supports subsequent CCP activities and ultimately, any required major capital improvements.

A summary of CPE elements and the City's approach to completing this CPE are provided in **Table 1-1**.

Table 1-1 CPE Summary

CPE Element	Comment	City of Florence Implementation Approach
1. Data Collection A. Kick-off Meeting B. Plant Tour C. Detailed Data Gathering	Completed generally in accordance with CPE guidelines	- Existing data, including record drawings, SOPs, recent flow and loading data, projected flows and loadings, and process performance data were reviewed and evaluated - Interviews were used to gather information on perceived plant performance issues and constraints
2. Evaluation of Major Unit Processes A. Wastewater Pumping B. Screening C. Grit Removal D. Biological Treatment E. Disinfection	Point scoring system and comprehensive spreadsheet analysis was used to perform the process evaluation	- Current period flows and loadings were established - Flow and loading design criteria were compared to SCDHEC standards and other relevant design criteria - A process evaluation was conducted to establish capacity constraints - Hydraulic analyses were performed to identify hydraulic constraints
3. Prioritization of Performance-Limiting Factors	Limited to design, administration, maintenance and operations issues	- Administrative factors were evaluated to extent necessary to identify operations (and/or maintenance) factors that adversely impact performance, and to address implementation of recommendations if necessary - Design factors included hydraulic capacity, process controls, level of automation, flow and measurement capabilities, and reliability criteria (per EPA guidelines) - Operations factors included staffing level, operator training, SOPs, laboratory analysis procedures (including QA/QC) and data management

1.4 CPE Report Overview

The following sections of this report are briefly described below.

Section 2 provides an overview of the Timmonsville WWTP. This section provides a general description of wastewater treatment unit processes, operational description, treatment requirements and effluent limitations, treatment process and equipment descriptions and comparison to SCDHEC design criteria, influent flows and loadings, and treatment performance summaries. A mass balance is also included for the WWTP.

Section 3 presents the results of hydraulic analyses of the facility.

Section 4 presents the results of the process analyses. The primary purpose of this analysis was to determine the average annual and peak flow capacity of the WWTP. Specifically, the plant was analyzed to determine the peak flow that could be treated without experiencing a *Bypass* as prohibited by currently applicable NPDES permits.

Section 5 presents the results of a review of WWTP administration, operations and maintenance. The objective of this review was to determine if these factors adversely impact performance of existing facilities and to present recommendations for addressing any identified performance limiting factors.

Section 6 presents a summary of CPE findings and conclusions.

Section 7 presents a recommended CCP implementation plan, including procedures to address identified deficiencies and a schedule.

Section 2

Timmonsville WWTP Process Performance Evaluation

The purpose of this section of the CPE is to summarize the process performance of the existing wastewater treatment facilities at the Timmonsville WWTP. This section is divided into the following subsections:

2.1 Timmonsville WWTP General Description

2.2 Operational Description

2.3 Treatment Requirements and Effluent Limitations

2.4 Treatment Process and Equipment Descriptions

2.5 Effluent Discharge Violation History

2.6 References

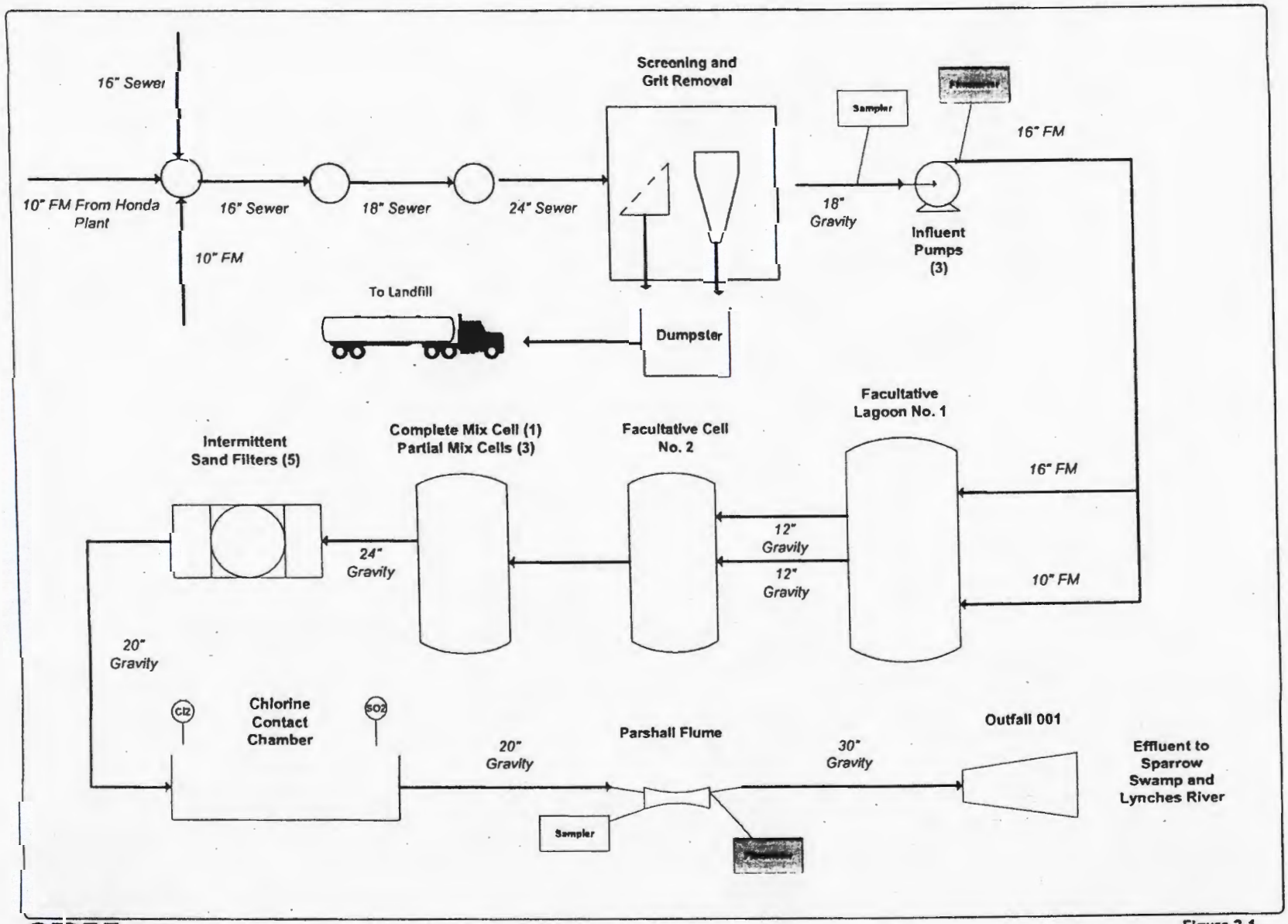
This evaluation describes each major process and currently applicable NPDES permit compliance parameters.

2.1 Timmonsville WWTP General Description

The Timmonsville WWTP is a basic wastewater treatment facility that was originally constructed in 1987 to serve a population of roughly 2,400 including residential, commercial, and industrial customers. The WWTP is located on Buie Drive just south of downtown Timmonsville. The facility underwent an expansion and upgrade in 2008 when the facultative lagoons, partial mix cells, intermittent sand filters, and chlorine contact chambers were constructed. The Timmonsville WWTP is designed to provide treatment to an average daily flow of 2 mgd with a peak hourly flow of 5 mgd. The plant consists of influent screening, grit removal, influent pumping, two facultative lagoons for wastewater treatment, three partial mix cells for aeration, five intermittent sand filters, a chlorine contact chamber and post aeration. Effluent leaving the WWTP is dechlorinated at the end of the chlorine contact chamber and routed to a Parshall flume located at the northwestern end of the plant for flow monitoring. Plant effluent then discharges by gravity to Sparrow Swamp and ultimately Lynches River. The Timmonsville WWTP currently is unable to perform solids processing at the plant. A schematic of the Timmonsville WWTP is shown in **Figure 2-1**.

2.2 Operational Description

The Timmonsville WWTP employs a facultative lagoon system followed by a plug flow aerated pond system. Wastewater flows up to 5 mgd enter Facultative Lagoon No. 1 which is designed to treat the wastewater through anoxic conditions by reducing oxygen levels in the basin. Typical facultative lagoons consist of three layers that provide varying levels of treatment: top, intermediate, and bottom. The top layer contains dissolved oxygen from atmospheric reaeration and algal respiration to support



CDM Smith

Figure 2-1
Timmonsville WWTP CPE
Process Schematic

administratively continued by SCDHEC until a new permit could be issued. Language addressing the permitting history and permit status of the Timmonsville WWTP can be found in Paragraph 1.8 of the CD:

"WHEREAS, the Complaint alleges that Timmonsville violated the CWA, 33 U.S.C. 1251-1387, for failing to comply with the requirements of its National Pollutant Discharge Elimination System ("NPDES") Permit No. SC0025356, which SCDHEC issued to Timmonsville on June 17, 2002, with an effective date of August 1, 2002, and an expiration date of September 30, 2006 (hereinafter "Permit A"); and which the EPA re-issued to Timmonsville on August 31, 2006, with an effective date of October 1, 2006, and an expiration date of August 31, 2008 (hereinafter "Permit B"). In March 2008, Timmonsville submitted its reapplication for Permit No. SC0025356 to SCDHEC. On March 26, 2008, SCDHEC informed Timmonsville that its reapplication was incomplete, and granted Timmonsville an extension of time until July 14, 2008 to resubmit a completed application. On July 10, 2008, Timmonsville submitted a completed reapplication for Permit No. SC0025356 to SCDHEC. ***SCDHEC administratively continued Timmonsville's Permit No. SC0025356 effective July 18, 2008.***"

The permit limits for conventional pollutants are shown in **Table 2-1**. Mass loadings are based on 2.0 mgd average daily flow.

Table 2-1 NPDES Effluent Limits for the Timmonsville WWTP

	Monthly Average	Weekly Average	Daily Maximum
Biochemical Oxygen Demand (BOD_5)[1]			
- March to October	7.5 mg/L 125 lb/day	11.25 mg/L 188 lb/day	N/A
- November to February	10 mg/L 167 lb/day	15 mg/L 250 lb/day	N/A
Total Suspended Solids[1]	30 mg/L 500 lb/day	45 mg/L 750 lb/day	N/A
Ammonia, as Nitrogen (NH3-N)			
- March to October	0.5 mg/L 8 lb/day	0.75 mg/L 12 lb/day	N/A
- November to February	2.5 mg/L 42 lb/day	3.75 mg/L 63 lb/day	N/A
Fecal Coliforms	200 colonies per 100 ml	--	400 colonies per 100 ml
Total Residual Chlorine	0.011 mg/L	–	0.019 mg/L
pH		6.0 to 8.5 SU	
Dissolved Oxygen		6 mg/L at all times	

Note: [1] 85 percent monthly average removal is also required.

The existing permit also contains limits for numerous other chemical constituents. A copy of the existing NPDES Permit No. SC0025356 has been provided in **Appendix A**.

2.4 Treatment Process and Equipment Descriptions

The following paragraphs give a brief description of the treatment processes and corresponding equipment.

Preliminary Treatment (Screening, Grit Removal, Pumping)

As wastewater enters the plant, the flow is directed to a 5 foot wide by 65 foot long by 13 foot deep concrete channel. The channel contains a 2 foot wide manual bar screen followed by a 2 foot wide mechanically cleaned bar screen. The manual bar screen is used primarily as a backup with the mechanical bar screen as the main mechanism to remove debris from the influent wastewater. Currently, the manual bar screen seems to be functional; however, it is not being used. Influent wastewater flows around the manual bar screen to the mechanical bar screen. The mechanical bar screen is completely inoperable and has experienced catastrophic failure. Influent wastewater flows around the mechanical bar screen to the grit unit. Similar to the mechanical bar screen, the grit unit and associated grit pumps located on the southern end of the Headworks channel are also not in operation and seems to have experienced catastrophic failure. It is apparent that since the bar screens and grit unit are not being used or are not functional, rags and debris that do not settle out in the headworks channel or the influent wetwell are being pumped to the WWTP. Severe corrosion on the bar screens and grit unit indicates elevated hydrogen sulfide (H_2S) levels at the headworks.

After screening, the raw wastewater enters a wetwell with a volume of approximately 45,300 gallons (21.5 feet long by 16 feet wide by 17.6 feet deep), and constant speed centrifugal pumps convey the wastewater to Facultative Lagoon No.1. Three influent pumps occupy the pump room located above the wetwell. The third pump was recently added as part of the WWTP upgrade in 2007. Based on discussions with operations staff, an impeller and a belt drive on one of the pumps have been recently replaced. Also, they indicated that the interior of the pump volutes are worn out. The pump check valves slam upon shutdown, most likely due to the orientation of the check valve. An influent sampling station is installed and seems to be in good working condition. A magnetic type flow meter is installed on the common discharge line from the influent pumps and also seems be in good condition.

Secondary Treatment

The volume of the facultative lagoons and complete and partial mix cells are 20 million gallons and 12.2 million gallons, respectively. Wastewater flows by gravity from the facultative lagoons to the partial mix cells. The facultative lagoons have not been cleaned since their installation in 2007 and most likely have accumulated solids and debris in the lower zone. The aerated cells contain mechanical surface aerators that are used to keep solids in suspension and provide process related functions. The mechanical mixers are corroded and require regular motor and propeller replacement. The containment liner in the lagoons and aerated cells has been breached in several areas and several aerators are currently out of service.

Filtration

Five intermittent sand filters provide tertiary treatment for the treated wastewater from the partially mix cells. Each filter is 420 feet long by 100 feet wide with a sand media depth of approximately 2.5 feet. Currently, all of the filters have experienced operational failures such as:

- Media blinding causing surface ponding and subsequent overflow
- Dried areas of the filter surface has accumulated solids and algae collected
- Uneven distribution of wastewater across the filter causing

Furthermore, several of the mud valves that are used to allow wastewater to enter each filter are in disrepair. Due to clogging of the filters, Timmonsville staff has installed a temporary trailer mounted pump and forcemain *Bypass* excess flow from the partial mix cells to the chlorine contact chamber.

Disinfection

Disinfection is achieved by injecting chlorine solution into the wastewater and allowing enough contact time within two chlorine contact chambers to reduce pathogen organisms to below NPDES permit limits. Each chlorine contact chamber is 52 feet long by 12 feet wide with a side water depth of 6 feet (approximately 28,000 gallons). The chlorine feed equipment consists of two (2) one ton chlorine gas tanks. A prefabricated chlorine gas eductor system injects chlorine gas into a non-potable water supply to provide chlorine solution. Dechlorination is accomplished by the injection of sulfur dioxide (SO_2) solution into the common effluent channel of the chlorine contact chamber. The dechlorination system consists of two (2) 150 lb sulfur dioxide gas cylinders that utilize the same prefabricated eductor system to generate sulfur dioxide solution. Dechlorination is performed to reduce the chlorine levels in the wastewater to below NPDES limits (0.011 mg/L residual chlorine) prior to discharge to Sparrow Swamp. The centrifugal blower, designed to deliver oxygen to the effluent wastewater, is not in working condition.

Solids Processing

The Timmonsville WWTP utilizes a basic lagoon type technology to treat its wastewater. Therefore, the WWTP is not capable of processing solids accumulated in the various treatment systems.

SCDHEC Reliability Criteria

For components included in the design of Reliability Class I works, the following backup requirements apply.

Mechanically Cleaned Bar Screens or Equivalent Devices - A backup bar screen shall be provided. It is permissible for the backup bar screen to be designed for manual cleaning only. Works with only two bar screens shall have at least one bar screen designed to permit manual cleaning.

- A manual backup bar screen is installed at the WWTP Headworks.

Pumps - A backup pump shall be provided for each set of pumps which performs the same function. The capacity of the pumps shall be such that, with any one pump out of service, the remaining pumps will have the capacity to handle the peak flow. It is permissible for one pump to serve as backup to more than one set of pumps.

- There are three pumps installed at the Influent Pump Station, two are duty with one standby. The pumps alternate starts to reduce motor starts.

Primary, Intermediate and Final Sedimentation Basins, Trickling Filters, and Tertiary Filters - There shall be a sufficient number of units of a size such that, with the largest flow capacity unit out of service, the remaining units shall have a design flow capacity of at least 75 percent of the total design flow to that unit operation.

- Hydraulic constraints outlined in Section 3 considered one filter out of service for hydraulic capabilities.

Aeration Blowers and/or Mechanical Aerators - There shall be sufficient number of blowers and/or aerators to enable the design oxygen transfer to be maintained with the largest capacity unit out of service. It is permissible for the backup unit to be an un-installed unit, provided that the installed unit can be easily removed and replaced. However, at least two (2) units shall be installed.

- Based on the assumptions outlined in Section 4, the mechanical aerators in the complete and partial mix cells are adequately sized to supply the oxygen transfer necessary. However, there does not seem to be backup aerators for reliability purposes.
- A single blower was installed to deliver oxygen into the effluent channel of the Chlorine Contact Chamber. It is not known if a spare was provided as part of the 2008 upgrades.

2.5 Effluent Discharge Violation History

Section I.9 of the CD summarizes the history of permit violations occurred by the Town of Timmonsville:

" Whereas, the Complaint alleges that Timmonsville failed to comply with the requirements of Permits A and B in the following manners: operations and maintenance violations; numerous pretreatment program implementation and reporting violations; at least 442 effluent monitoring and/or reporting violations; at least 485 effluent limit violations; at least 49 releases of untreated or partially-treated wastewater. The Complaint alleges that Timmonsville had these violations of its NPDES Permits beginning April 1, 2003, through the date of the Complaint."

It is CDM Smiths understanding that a majority of the 485 effluent limit violations were due to high toxicity concentrations found in the wastewater discharge. The high toxicity concentrations were likely a result from the addition of a pesticide called "Strike" to the wastewater by plant personnel in an attempt to control the growth of several nuisance pests. This practice has ceased for several years and as a result there have been minimal reports of effluent limit violations. The 49 releases of untreated or partially-treated wastewater are related to sanitary sewer overflows (SSOs). SSOs will be addressed by CDM Smith in a separate report.

2.6 References

The following record drawings and documents were used in the development of the CPE:

1984, Improving POTW Performance Using the Composite Correction Program Approach Handbook, United Stated Environmental Protection Agency.

2008, Wastewater System Improvements Record Drawings, Town of Timmonsville, SC, B.P. Barber & Associates, Inc.

2012, Water Compliance Inspection Report, Town of Timmonsville, SC, United States Environmental Protection Agency.

2013, Timmonsville Wastewater Treatment Plant Filter Inspection, Town of Timmonsville, SC, CDM Smith Inc.

2013, Preliminary Engineering Report, Town of Timmonsville, SC, CDM Smith Inc.

Section 3

WWTP Flow and Hydraulic Analyses

3.1 Overview

Hydraulic analyses of the WWTP were performed to determine if hydraulic constraints would potentially result in Bypasses in accordance with currently applicable NPDES permits, or otherwise limit the potential performance of the unit processes and process controls. The initial step was to analyze the current flow conditions. Next, the hydraulic model Visual Hydraulics® and Bentley WaterGEMS® were utilized to analyze peak flow scenarios at the WWTP.

3.2 Flow Conditions

The Timmonsville WWTP is currently rated to handle an Average Daily Flow of 2.0 million gallons per day (mgd) as permitted in NPDES Permit No. SC0025356. Per the 2008 record drawings, the plant was designed to process a peak flow of 5 mgd. Furthermore, Section VIII, Paragraph 57.a.(ii) of the CD states that "the CPE shall identify the flow that the WWTP may take without experiencing a Prohibited Bypass." Therefore, the hydraulic analysis evaluated both the design peak flow of the WWTP and the maximum flow the plant can handle without experiencing a Prohibited Bypass or sanitary sewer overflow. Note that future repairs to the Town of Timmonsville sanitary sewer collection system are expected to reduce infiltration and inflow of rainwater and groundwater and subsequently reduce influent flows to the WWTP.

3.3 Hydraulic Analysis

3.3.1 Analysis Procedure/Approach

The hydraulic profile calculation began with the most downstream control point water surface elevation at Sparrow Swamp and added all hydraulic losses one-by-one back to the headworks while incorporating intermediate hydraulic controls and devices. Intermediate hydraulic boundaries included weirs and Parshall flumes. Friction losses in piping, conduits, and open channels were obtained using the Mannings equation for the WWTP hydraulic analysis and the Hazen-Williams equation for the Influent Pump Station analysis. Minor head losses at all fittings, transitions, openings, gates, valves and open channel bends were computed by multiplying the appropriate coefficient by the velocity head. Currently, the manual and mechanical bar screens at the WWTP are inoperable and flow is bypassed around them. However, for the purposes of this report the head loss through the bar screens will be considered for the hydraulic analysis.

Assumptions

The following assumptions were made for this analysis:

- Steady state flow conditions throughout the plant.
- One 6mm mechanical bar screen in operation at the Headworks. See Appendix B for additional information.
- Four out of five filters in operation.

- Headloss through filter media is based on the existing hydraulic profile in 2008 record drawings by B.P. Barber & Associates. See Appendix B for additional information.
- Peak flow through a single chlorine contact chamber.
- Dimensions and flow paths in the units were per 2008 record drawings by B.P. Barber & Associates, Inc.
- No field survey or calibrations of the model were conducted.

Flow Conditions Analyzed

Analysis focused primarily on addressing the following hydraulic issues:

- Confirming influent pumping capacities.
- Does the existing Parshall flume operate properly at 5 mgd?
- What are the hydraulic constraints at 5 mgd?
- What is the hydraulic capacity of the biological system?

3.3.2 Influent Pump Station Capacity

The existing influent pump station is located approximately 1,000 feet northwest of the main Timmonsville WWTP. The pump station was recently modified in 2008, which included the installation of a third pump, associated electrical equipment, bypass piping, and sampling instrumentation. The influent pump station consists of three (3) constant speed, Gorman Rupp self-priming centrifugal pumps which are installed directly above the influent pump station wetwell. Raw wastewater enters the influent wetwell via an 18-inch gravity pipe from the Headworks channel. Characteristics of the existing Timmonsville WWTP Influent Pump Station are summarized in **Table 3-1** below. Information on the existing influent pumps, including pump curves, is provided in Appendix B.

Table 3-1 Existing Timmonsville WWTP Influent Pump Station Characteristics

Parameter	Value
Number of Pumps	3 (2 Duty + 1 Standby)
Type	Self-Priming, Centrifugal
Flow Per Pump (gpm)	2,140
Total Head (ft)	50
Motor Horsepower	40
Maximum Speed (rpm)	1050
Impeller Diameter (inches)	14.75
Suction Size/Discharge Size (inches)	10/10
Pump Manufacturer	Gorman Rupp
Pump Model Number	T10A-B-4

CDM Smith conducted a hydraulic analysis using Bentley WaterGEMS© model to analyze the capacity of the existing Influent Pump Station at the Timmonsville WWTP. CDM Smith used available information on the size, elevations, and layouts of the pump stations and yard piping. The Hazen-Williams friction loss formula was used in the hydraulic model for this analysis. Minor loss values were calculated using K-factors specific for the valves, fittings, and appurtenances found in the existing Influent Pump Station. In order to predict the operating range of the existing pumps, scenarios were created in the model to simulate high head and low head conditions. Factors that affect these conditions for this pump station is the varying water elevation in the influent pump station wetwell and modifying the Hazen-Williams C-factor to consider pipe age. High head and low head conditions and their associated parameters are provided in **Table 3-2** below.

Table 3-2 High Head and Low Head Conditions

	Hazen Williams C-Factor	Influent Wetwell Elevation	Discharge Elevation (at Facultative Lagoon No. 1)
Low Head Condition	140	110.9 ft	147 ft
High Head Condition	120	109.2 ft	147 ft

Model results based on the number of pumps in operation are summarized in **Table 3-3** below.

Table 3-3 Influent Pump Station Capacity

	Maximum Capacity (mgd)		
	One Pump	Two Pump	Three Pump
Low Head Condition	3	5	6
High Head Condition	3	5	5

3.3.3 Analysis Results

Two scenarios were evaluated for the Timmonsville WWTP hydraulic analysis. Higher flow rates were not evaluated because there is not sufficient influent pumping capacity to deliver these flows.

Scenario 1

5 mgd influent flow rate; all units in service; Sparrow Swamp water surface elevation at 122.20 feet (100 year flood elevation); influent pump station wetwell at 110.9 feet.

- The model indicates a hydraulic jump occurs in the pipe between Manhole No. 2 and Manhole No. 3 located at the WWTP discharge to Sparrow Swamp. This is not believed to have any adverse effects on the overall plant hydraulics, however, it should be noted for future design purposes.
- The Parshall flume, with a throat width of 1.5 feet and invert elevation of 123.36, is adequately sized to handle the peak flow.
- The change in elevation from the 4 foot weir to the common effluent channel, at the end of the Chlorine Contact Chamber, is roughly 3-inches. However, at peak flow the weir remains unsubmerged and should not cause hydraulic or process concerns. It should be noted that this weir also acts as the "control point" for the entire WWTP (excluding the Headworks).

- The water surface elevation in the intermittent sand filters is 141.11. The top of wall elevation of the sand filters is 143.00. Thus, there is ample amount of freeboard in the filters assuming the filters are clean.
- The Complete Mix Cell, Partial Mix Cells and Facultative Cell No. 2 combined volume equates to roughly 12.2 million gallons (MG). At 5 mgd, the velocity head and subsequent headloss in these basins are very low and as such should be able to handle flows greater than 5 mgd.
- The volume in Facultative Lagoon No. 1 equates to roughly 20 MG. At 5 mgd, the velocity head and subsequent headloss in the basin is very low and as such can easily manage the peak flow of 5 mgd.
- The plant headworks is not hydraulically connected to the rest of the plant since wastewater is pumped from the headworks to Facultative Lagoon No. 1.
- Two influent pumps with a combined capacity of 5 mgd, and one pump standby.
- The change in elevation from the 5 foot outlet weir to the outlet box, at the end of the headworks, is roughly 2-inches. At peak flow the weir remains unsubmerged and should not cause hydraulic or process concerns. It should be noted that this weir acts as the "control point" for the Timmonsville WWTP Headworks.
- Headworks intermediate weir is not submerged.

Scenario 2

6 mgd influent flow rate; all units in service; Sparrow Swamp water surface elevation at 122.20 feet (100 year flood elevation); influent pump station wetwell at 110.9 feet.

- The model indicates a hydraulic jump occurs in the pipe between Manhole No. 2 and Manhole No. 3 located at the WWTP discharge to Sparrow Swamp. This is not believed to have any adverse effects on the overall plant hydraulics, however, it should be noted for future design purposes.
- The Parshall flume, with a throat width of 1.5 feet and invert elevation of 123.36, is adequately sized to handle the 6 mgd flow.
- The change in elevation from the 4 foot weir to the common effluent channel, at the end of the Chlorine Contact Chamber, is roughly 2.5-inches. However, at 6 mgd flow the weir remains unsubmerged and should not cause hydraulic or process concerns. It should be noted that this weir also acts as the "control point" for the entire WWTP (excluding the Headworks).
- The water surface elevation in the intermittent sand filters is 141.35. The top of wall elevation of the sand filters is 143.00. Thus, there is ample amount of freeboard in the filters assuming the filters are clean.
- The Complete Mix, Partial Mix Cells and Facultative Cell No. 2 combined volume equates to roughly 12.2 MG. At 5 mgd, the velocity head and subsequent headloss in these basins are very low and as such can easily manage the 6 mgd flow rate.

- The volume in Facultative Lagoon No. 1 equates to roughly 20 MG. At 5 mgd, the velocity head and subsequent headloss in the basin is very low and as such can easily manage the 6 mgd flow rate.
- The plant headworks is not hydraulically connected to the rest of the plant since wastewater is pumped from the Headworks to Facultative Lagoon No. 1.
- Three influent pumps on at low head conditions (6 mgd).
- The outlet weir at the end of the Headworks is partially submerged at 6 mgd.
- Headworks intermediate weir is not submerged.

3.3.4 Conclusions

- The Timmonsville WWTP maximum hydraulic capacity is 6 mgd, dictated by the maximum capacity of the Influent Pump Station and is the flow the WWTP can take without experiencing a Prohibited Bypass. It is clear that historical bypassing of plant processes occur due to the malfunction of the intermittent sand filters.
- The hydraulic capacity of the biological system (facultative lagoons and partial mix cells) exceeds 6 mgd, however this exceeds the firm pumping capacity of the influent pump station.
- Per the model results, the Parshall flume can handle flows up to 6 mgd.

Influent Pumping Capacity

Firm capacity is defined as the largest pump out of service at high head conditions. Maximum Capacity is defined as all pumps in operation at low head conditions.

	Firm Capacity	Maximum Capacity
• Influent Pump Station	5 mgd	6 mgd

The influent pumps are adequately sized to handle the peak flow of 5 mgd. Based on discussions with plant staff, a single pump is currently utilized to handle influent flows. Also, the main breaker is sized to support operation of up to two pumps at a time, not the total installed pump horsepower, and as a result, only two pumps can run at a time. Therefore, the pump station and subsequently WWTP is limited in its capacity to 5 mgd.

Section 4

Process Evaluation

4.1 Overview

This section will evaluate the current WWTP processes in order to determine if proper effluent standards can be achieved when the WWTP is at design capacity. The calculations and the results of the process evaluation task are discussed.

The analysis consisted of a detailed evaluation of the WWTP operational data, including flow and mass load data from October 2012 through November 2012. Nine influent wastewater samples were collected measuring BOD_5 and TSS. The data received was limited in nature but were assumed to be typical for this facility. The following assumptions were made:

1. The Total Kjeldahl Nitrogen (TKN) was assumed to be 20% of the influent BOD_5 load;
2. The ammonia loading was assumed to be 66% of the influent TKN; and
3. Influent TSS concentration into the Intermittent Sand Filters was assumed to be greater than 50 mg/L.

Calculations were completed using existing and calculated flow, loading data, and temperature to estimate the effluent quality. The effluent quality results include parameters such as TSS, BOD, and ammonia-nitrogen.

The capacity of the existing aeration mixing cells at Timmonsville WWTP was calculated to determine if sufficient capacity is available for the projected oxygen demand. In addition, TSS effluent was calculated at the intermittent sand filters and the volume of the chlorine basins was checked to determine if they provide adequate contact time.

4.2 Data Analysis and Performance Summary

The data consists of measurements taken from October 2012 through November 2012. Nine influent samples were taken at the intake of Facultative Lagoon No. 1.

4.2.1 Influent Flows and Loadings

Influent Flow Rates

During the October 2012 through November 2012 sampling period, influent flow was not measured. The influent flow was assumed to be the equivalent to the effluent flow (which is measured). Therefore, the average daily influent flow rate was 0.67 mgd.

Figure 4-1 graphically shows the daily average flow rate. The figure shows that flow rate fluctuates and is directly proportional to rainfall amounts.

Influent Pollutant Loadings – Biochemical Oxygen Demand

Nine influent BOD_5 measurements were taken upstream of Facultative Lagoon No. 1 during the October-November 2012 sampling period. The average BOD_5 concentration during this time was 48 mg/L.

Figure 4-2 graphically shows the nine sample BOD concentrations ranging from 33 mg/L to 66 mg/L. The BOD concentrations are generally inversely proportional to influent flow rates indicating dilution effects infiltration and inflow into the Timmonsville WWTP.

Influent Pollutant Loadings – Total Suspended Solids

Nine influent TSS concentration measurements were taken upstream of Facultative Lagoon No. 1 during the October through November sampling period. The average influent TSS concentration at the Timmonsville WWTP was 70 mg/L and ranged from 38 mg/L to 118 mg/L.

Figure 4-3 graphically shows the average TSS concentration. TSS concentrations are generally inversely proportional to influent flow rate, indicating dilution effects from infiltration and inflow into the WWTP.

Influent Pollutant Loadings – Ammonia as Nitrogen (NH_4-N)

Influent NH_4-N concentration was not measured during the October through November 2012 sampling period. The average TKN concentration was assumed to be 20% of the influent BOD_5 yielding an estimated influent concentration of 10 mg/L. 66% of the influent TKN is assumed to be ammonia yielding an average concentration of 6 mg/L.

4.3 Timmonsville WWTP Calculation Development and Results

The existing treatment train includes: Facultative Lagoon No. 1, Facultative Cell No. 2, Complete Mix Cell No. 1, Partial Mix Cells No. 1-3, intermittent sand filters, chlorine contact basins, and post aeration treatment. Figure 2-1 shows a flow schematic.

The unit processes are evaluated using the mass load criteria in **Table 4-1.**

Table 4-1 Summary of ADF Influent Wastewater Characteristics for Timmonsville WWTP

Unit Process or Operation	Design Condition
Facultative Lagoons	Maximum monthly loads
Aeration Lagoons	Max day oxygen demand
Intermittent Sand Filters	Average daily flow
Disinfection	Peak hour flow

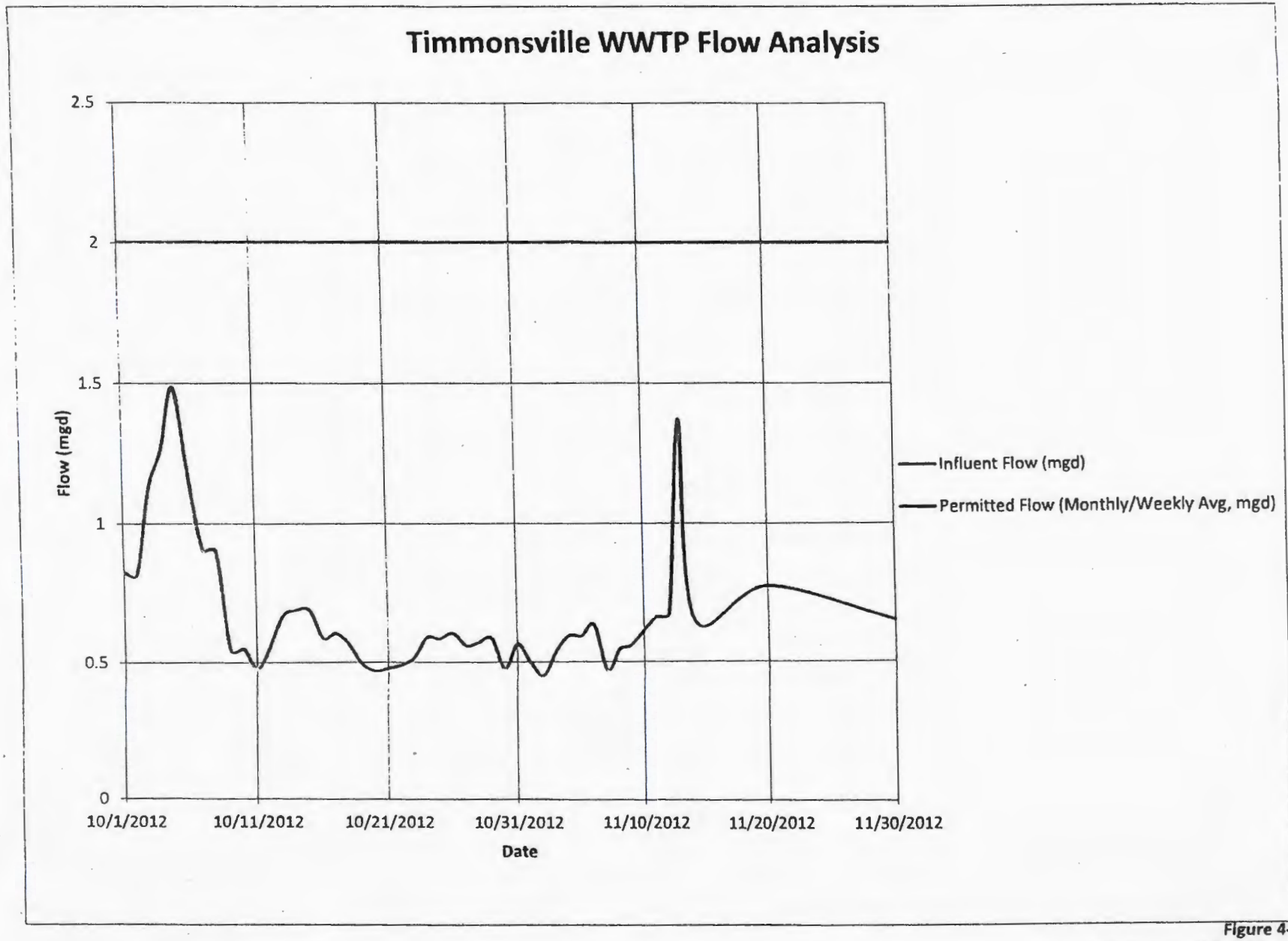


Figure 4-1
Timmonsville WWTP CPE
Influent Flow Analysis

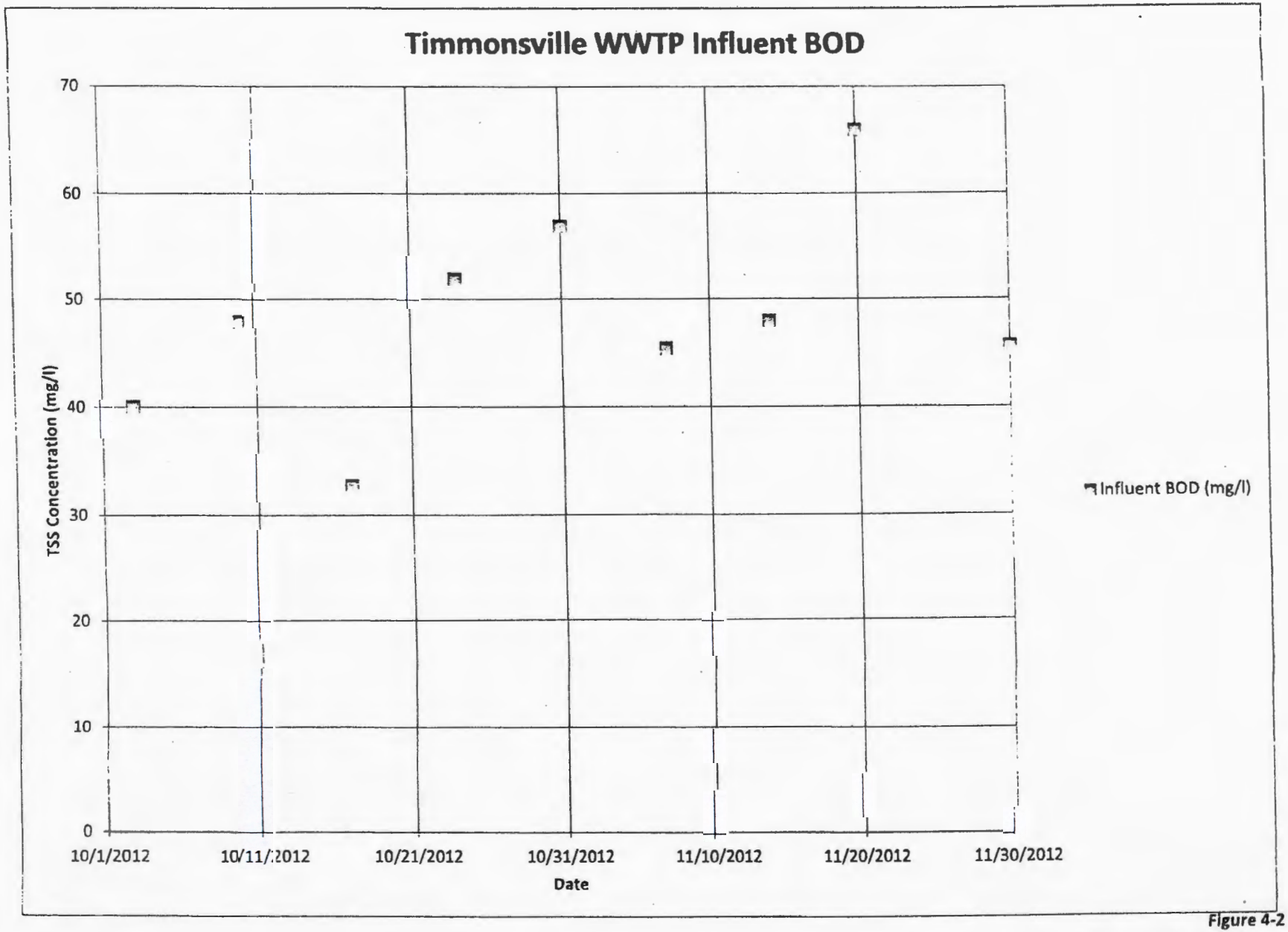


Figure 4-2
Timmonsville WWTP CPE
Influent BOD

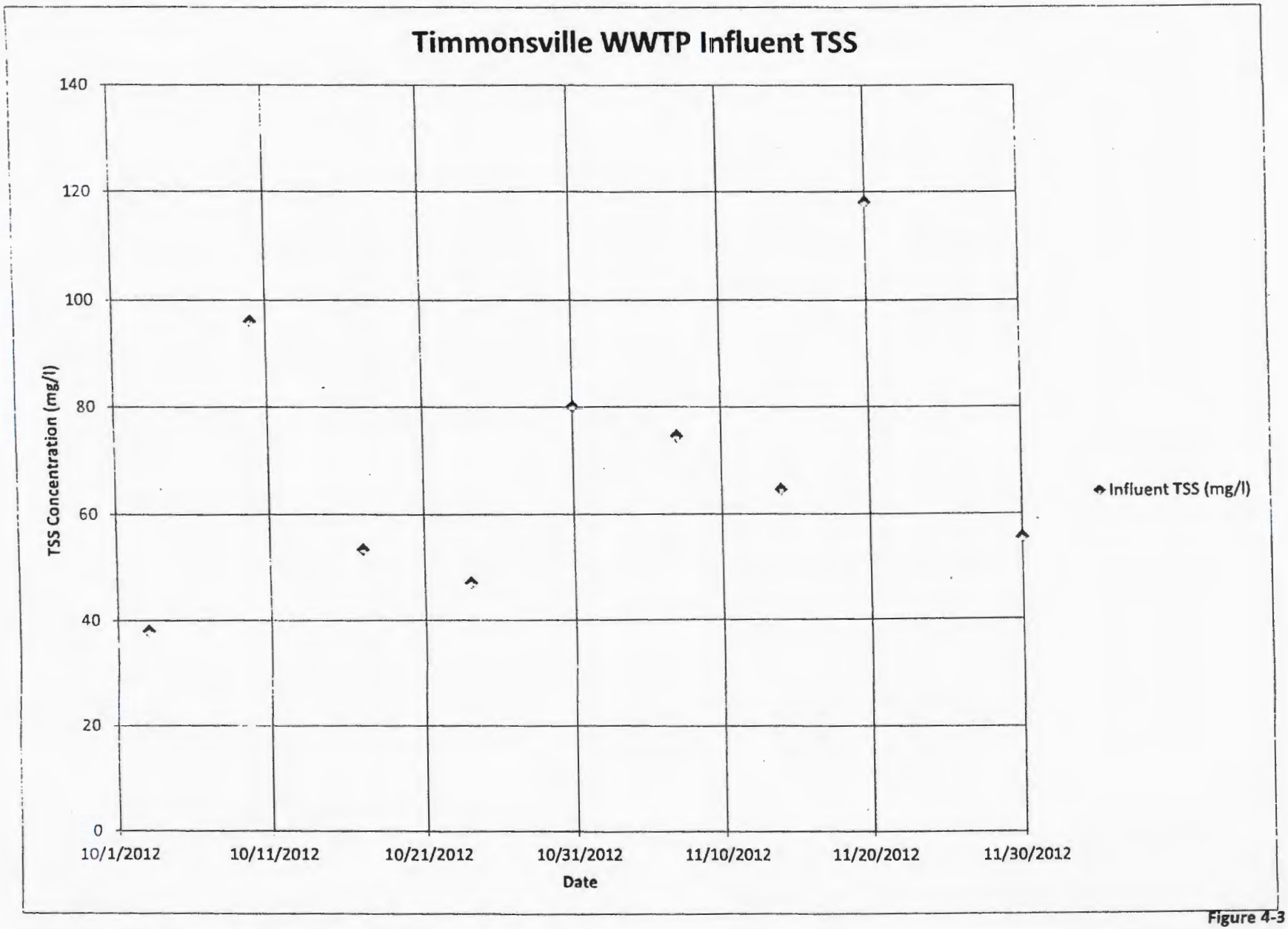


Figure 4-3
Timmonsville WWTP CPE
Influent TSS

4.3.1 Facultative Lagoon Treatment Capacity

4.3.1.1 Biochemical Oxygen Demand Removal

Many models for designing and analyzing facultative ponds are empirical and based on surface loading. The rate of BOD_5 removal in facultative ponds is known to follow first-order kinetics where the BOD_5 removal is proportional to the quantity of BOD_5 present in the lagoon (Kayombo et al., 2004).

Facultative Lagoon No. 1

The following equation was used to evaluate the surface BOD_5 loading based on influent BOD_5, flow, and surface area:

$$\frac{C_e}{C_o} = \frac{1}{1 + \frac{A}{Q} \times (0.0038 + 0.000134T) \times e^{(1.041+0.044T)\times(pH-6.6)}} \quad (3)$$

Where: C_e = Influent concentration of ($NH_4^+ + NH_3$), mg/L as N
C_o = Effluent concentration of ($NH_4^+ + NH_3$), mg/L as N
A = Surface area of the pond, m^2
Q = Flow rate, m^3/d
T = Temperature, °C

Facultative Lagoon No. 1

Various temperatures and pH's were assumed since pH and temperature data were not available. The pH was sampled in a nearby ditch containing wastewater when the sand filters became clogged and blinded. The average pH from these samples was 7.8. Temperature measurements were not taken. The following assumptions were made for the influent data of the Facultative Lagoon No. 1:

1. The average temperature was assumed to be 25.5 °C;
2. The average pH was assumed to be 7.8; and
3. Influent $NH_4^+ + NH_3$ was assumed to be the maximum monthly TKN concentration of 12.6 mg/L.

With a pond surface area of 62,110 m^2 (668,000 ft^2) and the design flow of 7,570 m^3/day (2 mgd), the calculated effluent concentration of ammonia nitrogen using Equation 3 was 10 mg/L.

Facultative Cell No. 2

Equation 3 was also used to calculate the nitrogen removal from Facultative Cell No. 2. The following assumptions were made:

1. The average temperature was assumed to be 25.5 °C;
2. The average pH was assumed to be 7.8; and
3. Influent $NH_4^+ + NH_3$ was assumed to be same as the calculated effluent from Facultative Lagoon No. 1: 10mg/L.

With a pond surface area of 13,250 m^2 (142,600 ft^2) and the design flow of 7,570 m^3/day (2 mgd), the calculated effluent concentration of ammonia nitrogen was 8 mg/L.

4.3.2 Aeration Capacity Calculations

This analysis evaluates the ability of the existing aeration system to meet the oxygen demand at maximum loadings to the Timmonsville WWTP. The Timmonsville WWTP uses floating mechanical aerators in both the Completely Mixed Cell No. 1 and the Partially Mixed Cells No. 1-3. In the Completely Mixed Cell, the aerated lagoon is equipped with six 20-hp aerators. The three Partially Mixed Cells are each equipped with three 3-hp aerators. For all aeration capacity evaluations, maximum daily loads were considered.

4.3.2.1 Completely Mixed Cell No. 1

Oxygen Demand Calculations

The oxygen demand in Completely Mixed Cell No. 1 was calculated using the influent BOD and TKN loads. In order to determine if the supplied oxygen was enough to treat the required oxygen demand, the following assumptions were made:

1. Mechanical surface aerators used in aeration lagoons supply 3 lb O_2/hp-hr (EPA, 2002b);
2. For maximum day loadings, 1.5 lb. of O_2 is required per pound of BOD removed;
3. For maximum day loadings, 4.6 lb. of O_2 are required per pound of NH_3-N removed;
4. No oxygen credit for nitrogen used for cell growth;
5. Firm capacity is based on one mechanical aerator out of service per lagoon;
6. The influent BOD in the Completely Mixed Cell No. 1 is equivalent to the effluent from Facultative Cell No. 2 under maximum day conditions; and
7. The influent nitrogen in the Completely Mixed Cell No. 1 is equivalent to the effluent from Facultative Cell No. 2 under maximum day conditions.

In order to accurately calculate the required oxygen in the lagoon, oxygen transfer efficiencies from clean water must be converted to the actual wastewater conditions expected in the aeration basins. The oxygen transfer rate under field operating conditions in wastewater will be less than that obtained in clean water. The following equation was used to calculate field condition transfer rates (CDM Smith, 2008):

$$OTE_{field} = SOTE \times \left(\frac{\beta\tau\Omega C_{SC} - C}{C_{SC}}\right) \times \alpha \times \theta^{(T-20)} \qquad (4)$$

Where:
- OTE_{field} = Oxygen transfer rate in field, mg/L per time
- SOTE = Standard oxygen transfer efficiency
- β = Oxygen solubility correction factor
- τ = Temperature correction factor
- Ω = Pressure ratio
- C_{SC} = Standard dissolved oxygen saturation, mg/L
- C = Minimum dissolved oxygen in system, mg/L
- α = Mass transfer correction
- θ = Temperature correction factor

The following assumptions were made for this calculation:

1. The oxygen solubility correction factor is assumed to be 0.95 for municipal wastewaters;
2. The temperature correction, tau, used was 0.91;
3. The mass transfer correction was assumed to be 0.9;
4. The temperature correction, theta, used was 1.15;

5. The minimum dissolved oxygen in the system was assumed to be 2 mg/L per South Carolina regulations; and

6. The standard dissolved oxygen saturation used was 9.09 due to the aerators location at the surface of the lagoon.

With the assumptions above, Equation 4 produced a correction factor of 0.67 oxygen transfer rate in the field per the standard oxygen transfer efficiency.

The maximum day BOD load at the effluent of Facultative Cell No. 2 was calculated to be 24 lb/day and a maximum day nitrogen load of 229 lb/day. Using the assumed oxygen requirements for removal and the above loadings and correction factor, the following was calculated:

Standard Maximum Day Demand: 1,630 lb O_2/day

Aeration Capacity for Completely Mixed Cells

The total supplied oxygen dose was calculated using the following parameters:

1. 100% efficiency for each surface aerator, 20 hp;

2. Firm capacity = total aerators – 1; and

3. Mechanical surface aerators used in aeration lagoons supply 3 lb O_2/hp-hr.

These assumptions were used to calculate the following standard capacity:

1. Total Capacity: 8,640 lb O_2/day (exceeds require O_2 demand); and

2. Firm Capacity: 7,200 lb O_2/day (exceeds required O_2 demand).

There is adequate aeration capacity to nitrify and remove BOD_5.

Biochemical Oxygen Demand Removal

The design of aerated lagoons is based on first-order BOD removal kinetics and a completely mixed model as follows:

This calculation resulted in an effluent BOD_5 of 0.68 mg/L. Therefore, there is adequate removal of BOD_5.

4.3.2.2 Partially Mixed Cells No. 1-3

Partially mixed lagoons can be conservatively modeled using completely mixed kinetics and first order kinetics (EPA, 2002b). The exception to a completely mixed system is differing reaction rate coefficients.

Partially mixed lagoons are not designed to keep all of the solids in the pond suspended or meet required oxygen demands. Thusly, anaerobic degradation of organic matter occurs (EPA, 1983). Furthermore, Completely Mixed Cell No. 1 has adequate oxygen delivery capacity.

Biochemical Oxygen Demand Removal

With the difference in mixing requirements from a completely mixed pond the following assumptions were made for Equation 5 to determine effluent BOD concentration at the end of all three cells:

1. The first order rate reaction constant was assumed to be 0.16 day^{-1} to account for lower temperatures with minimal removal; and
2. Influent BOD concentration was assumed to be 0.68 mg/L.

This calculation resulted in an effluent BOD of 0.04 mg/L.

4.3.3 Intermittent Sand Filters

Most of the TSS in the effluent of lagoons is caused by algae growth. Very little, if any, TSS in the effluent from lagoons is a residual of the TSS that enters the lagoon (Rich, 1993a). In the winter months with minimal algal growth, up to 90 percent TSS removal can be achieved (EPA, 2002a). However, during summer months, algal growth can be prominent and TSS removal can be negligible. Therefore, it is uncommon to calculate effluent TSS from facultative and aerated lagoons.

When determining if effluent TSS from intermittent sand filters can meet regulations, hydraulic loading rates are considered. As seen in **Table 4-2**, areas where high influent TSS concentrations are anticipated (above 50 mg/L on average), lower hydraulic loadings rates of 0.19-0.37 $m^3/m^2/day$ are recommended (EPA, 1983). The Timmonsville WWTP at 2 mgd has a hydraulic loading rate of 0.38 $m^3/m^2/day$, falling very closely to the recommended range.

Table 4-2 Summary of Recommended Hydraulic Loading Rates for Intermittent Sand Filters

Conditions	TSS Concentration (mg/L)	Recommended Hydraulic Loading Rate ($m^3/m^2/day$)
Low TSS	< 50	0.37-0.56
High TSS	>50	0.19-0.37
Timmonsville WWTP	70	0.38

According to the EPA, intermittent sand filters produce a high quality effluent with typical TSS concentrations of 5 mg/L or less with proper operation and maintenance, as well as nitrification of 80 percent or more of the applied ammonia (EPA, 2002a).

Reports in South Carolina record an NH_3-N effluent from the intermittent sand filters of less than 0.5 mg/L when the pH of the lagoon effluent is maintained at 7.5-8.0 (Rich, 1993b). Alkalinity may need to

be added in order to achieve this pH and effluent results. pH data was not available and therefore, a firm recommendation cannot be given.

In order to achieve this high quality results, the following operation and maintenance must be performed on a regular basis:

1. Skim sand when clogging or incrustations occur.
2. Replace sand as needed to maintain design depth and prevent clogging.
3. Weed as needed.
4. Prevent ice sheeting.

4.3.4 Chlorine Contact Basin Calculations

In order to determine if the chlorine contactors supply a sufficient detention time, the following assumptions were made:

1. Both basins in service for average daily flow.
2. Only one of two chorine contact basins in service for peak flow.
3. 50 percent of peak flow is used for peak contact time of contactors.

The volume per contactor was calculated to be 3,432 ft^3 (2,470 gallons) from a depth of 6 ft, width of 4 ft, and a length of 156 ft. For chlorination systems, South Carolina regulations require a minimum contact time of thirty (30) minutes at average daily flow and fifteen (15) minutes at peak design flow.

Average Daily Flow

The average daily flow at the Timmonsville WWTP is 2 mgd. To solve for detention time the following equation was used:

$$t = \frac{V}{Q} \qquad (6)$$

Where: t = contact time, minutes
V = volume of tank, gallons
Q = flow rate, gpm

A contact time of 37 minutes was calculated. There is adequate capacity in this scenario where both basins are in service.

Peak Design Flow

The peak design flow at the Timmonsville WWTP is 5 mgd. Using the assumptions and Equation 6 above, the following contact time was calculated:

A contact time of 14.8 minutes was calculated at 5 mgd with two basins in service, or 2.5 mgd with one basin in service.

Average day detention times exceed the state required minimum of 30 minutes. A contact time of 14.8 minutes is calculated at peak flow with 2 units in service and at 50% of peak flow with 1 unit out of service.

4.4 Effluent Flow Concentrations

Effluent Flow Rates

The daily average effluent flow rate at the Timmonsville WWTP was 0.67 mgd and ranged from 0.45 to 1.5 mgd from October through November 2012. **Figure 4-4** shows that all of these flows fall below the permitted flow of 2 mgd for weekly and monthly averages.

Effluent BOD_5

The effluent limits imposed by the NPDES permit include maximum BOD_5 concentrations of 10 mg/L from November through February, and 7 mg/L from March through October. **Figure 4-5** indicates compliance with these limits over the period of October 2012 through the end of November 2012.

Effluent TSS

The effluent limits imposed by the NPDES permit include maximum TSS concentration of 30 mg/ L (monthly) and 45 mg/L (weekly). **Figure 4-6** indicates compliance with these limits over the period of October 2012 through November 2012.

Effluent NH_4-N

The effluent limits imposed by the NPDES permit include seasonal maximum NH_4-N concentrations. Lower limits for NH_4-N concentrations apply during the period March 1 – October 31. These limits are 0.75 mg/L (weekly) and 0.5 mg/L (monthly). NH_3-N limits are 3.75 mg/L (weekly) and 2.5 mg/L (monthly) during the period November 1 through February 28. **Figure 4-7** indicates compliance with these limits over the period October 2012 through November 2012. While one data point exceeds the permitted monthly average in the beginning of October, this is only a daily sample and not an average for the month of October.

4.5 Summary

The potential average daily flow capacity of the Timmonsville WWTP based on current and calculated loading conditions was analyzed. However, these calculations assume relatively ideal conditions and only take into account the maximum day loadings for aeration systems.

Scoring the capacity of an aerated lagoon was performed and compared to the point system via the EPA's Handbook of Improving POTW Performance Using the Composite Correction Program Approach (1984). **Table 4-3** lists the values and score of the following required parameters:

- Hydraulic Detention Time,
- Organic Loading, and
- Oxygen Availability.

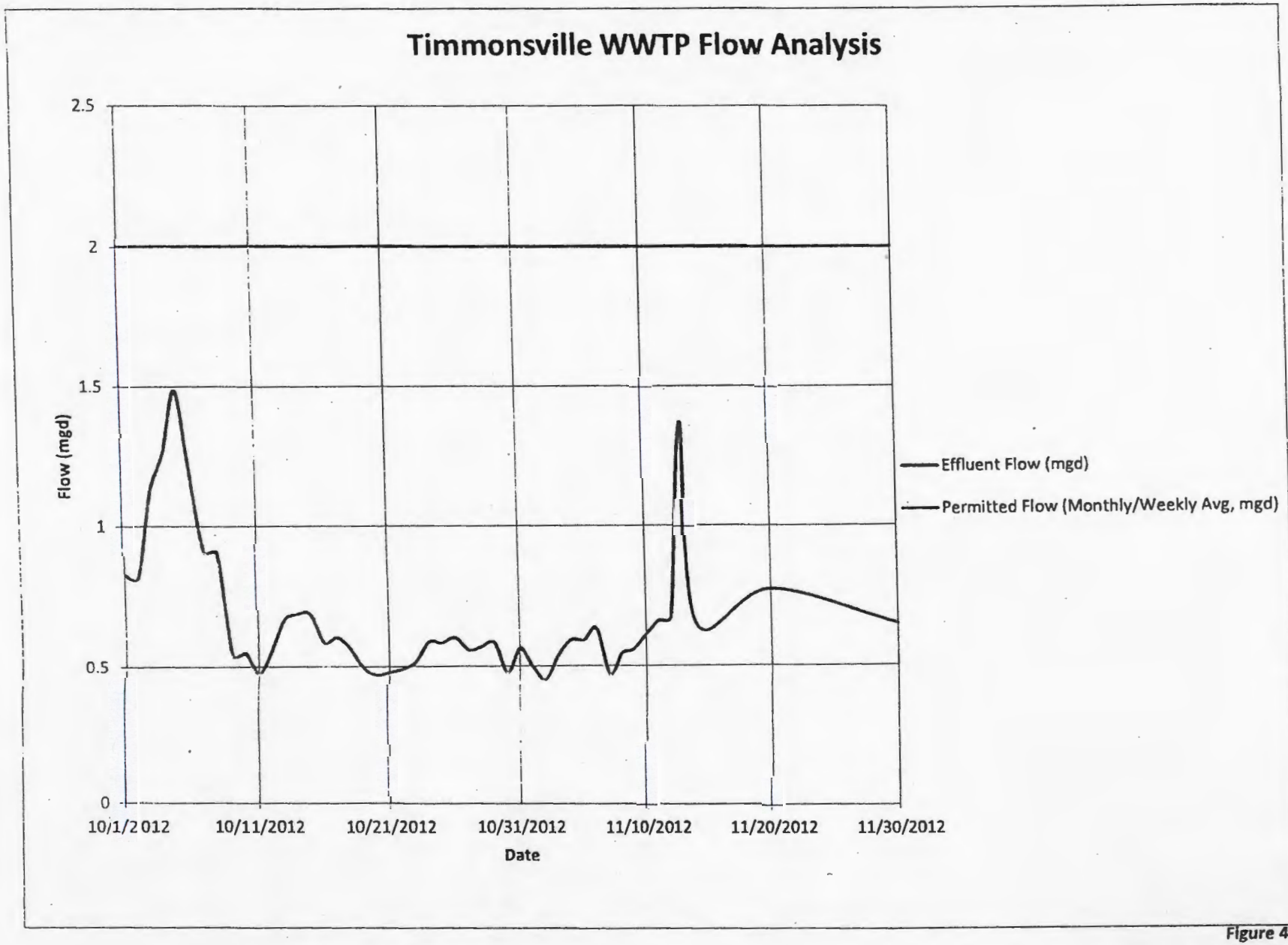


Figure 4-4
Timmonsville WWTP CPE
Effluent Flow Analysis

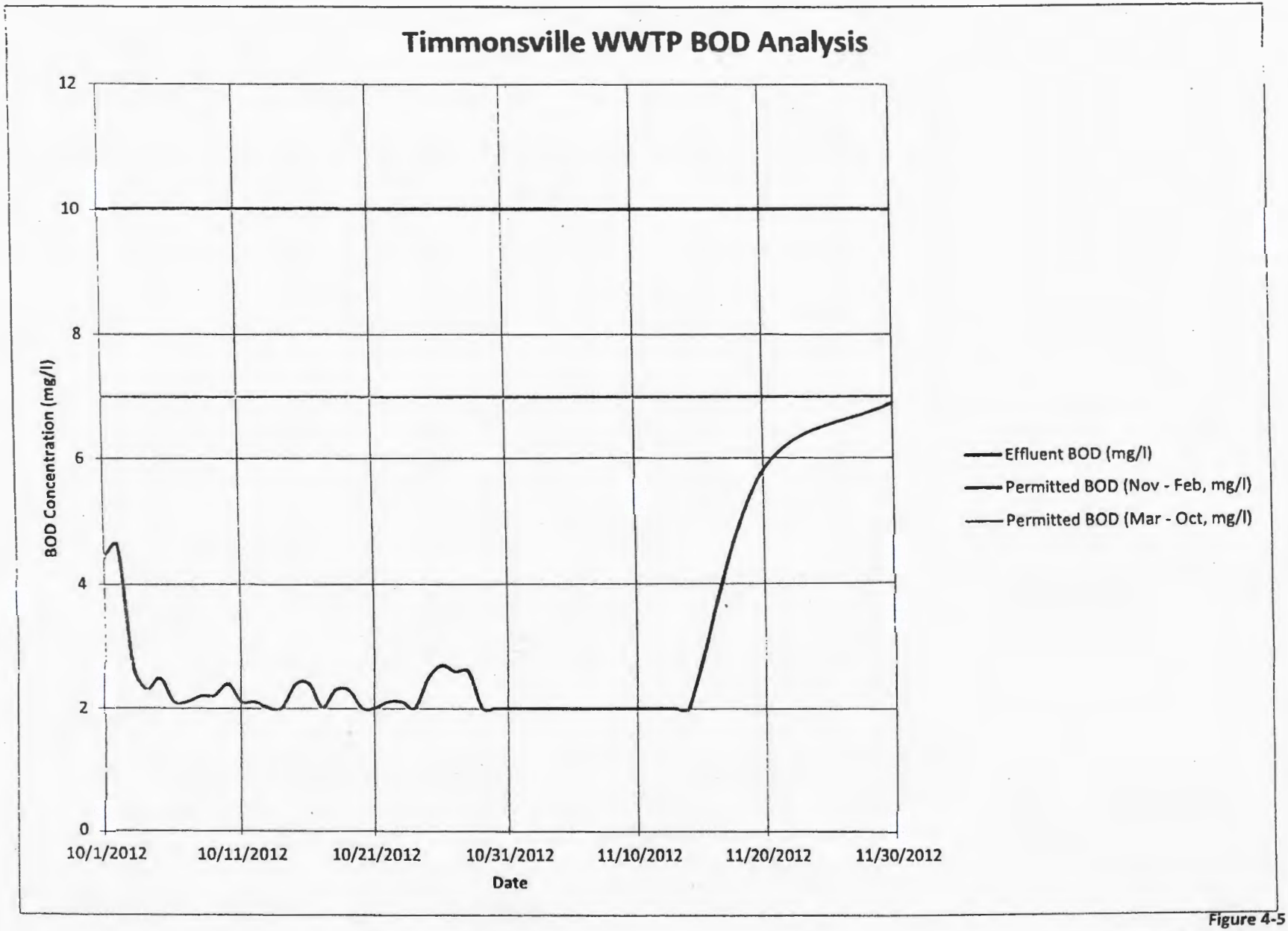


Figure 4-5

Timmonsville WWTP CPE

BOD Analysis

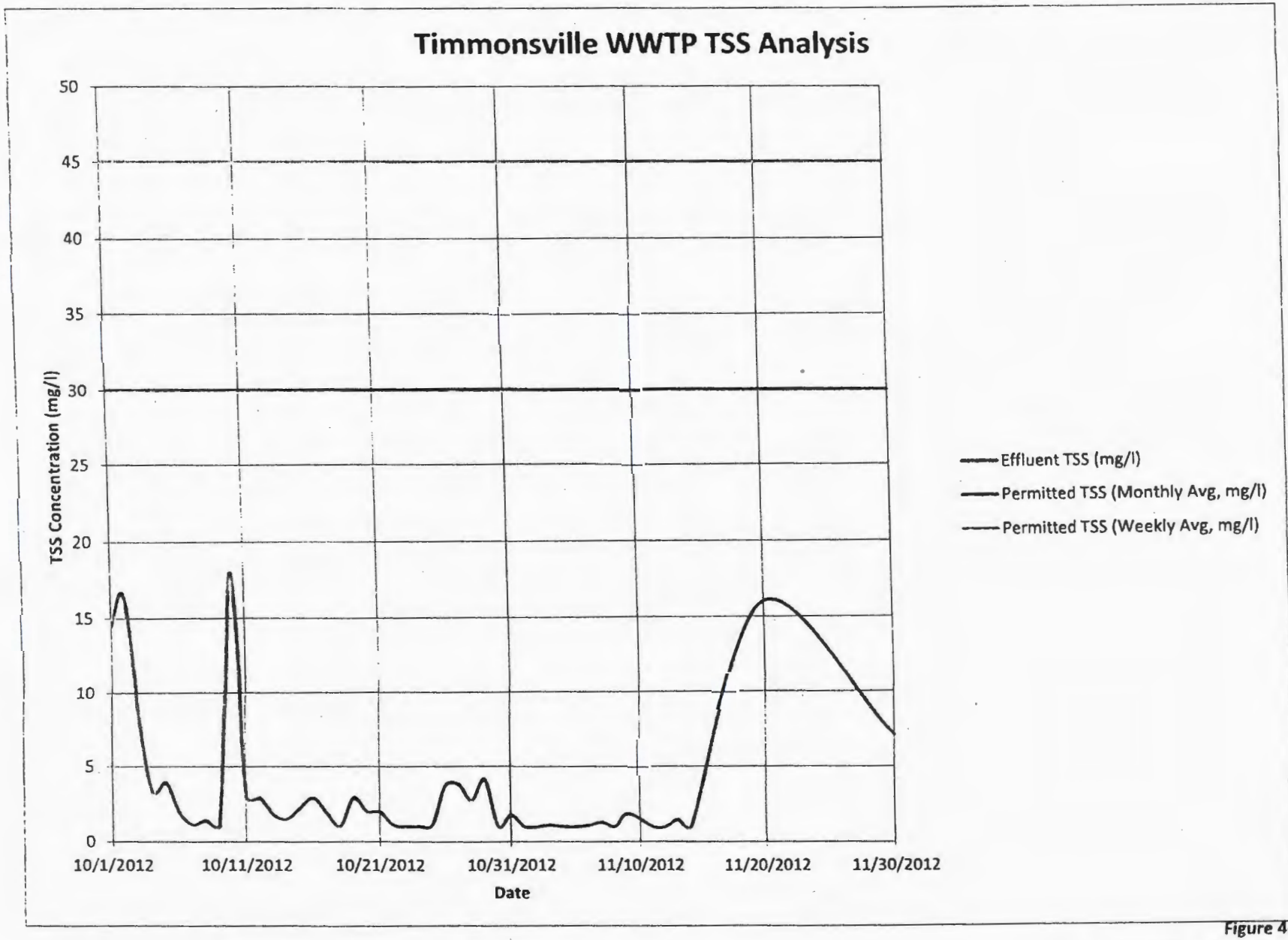


Figure 4-6
Timmonsville WWTP CPE
TSS Analysis

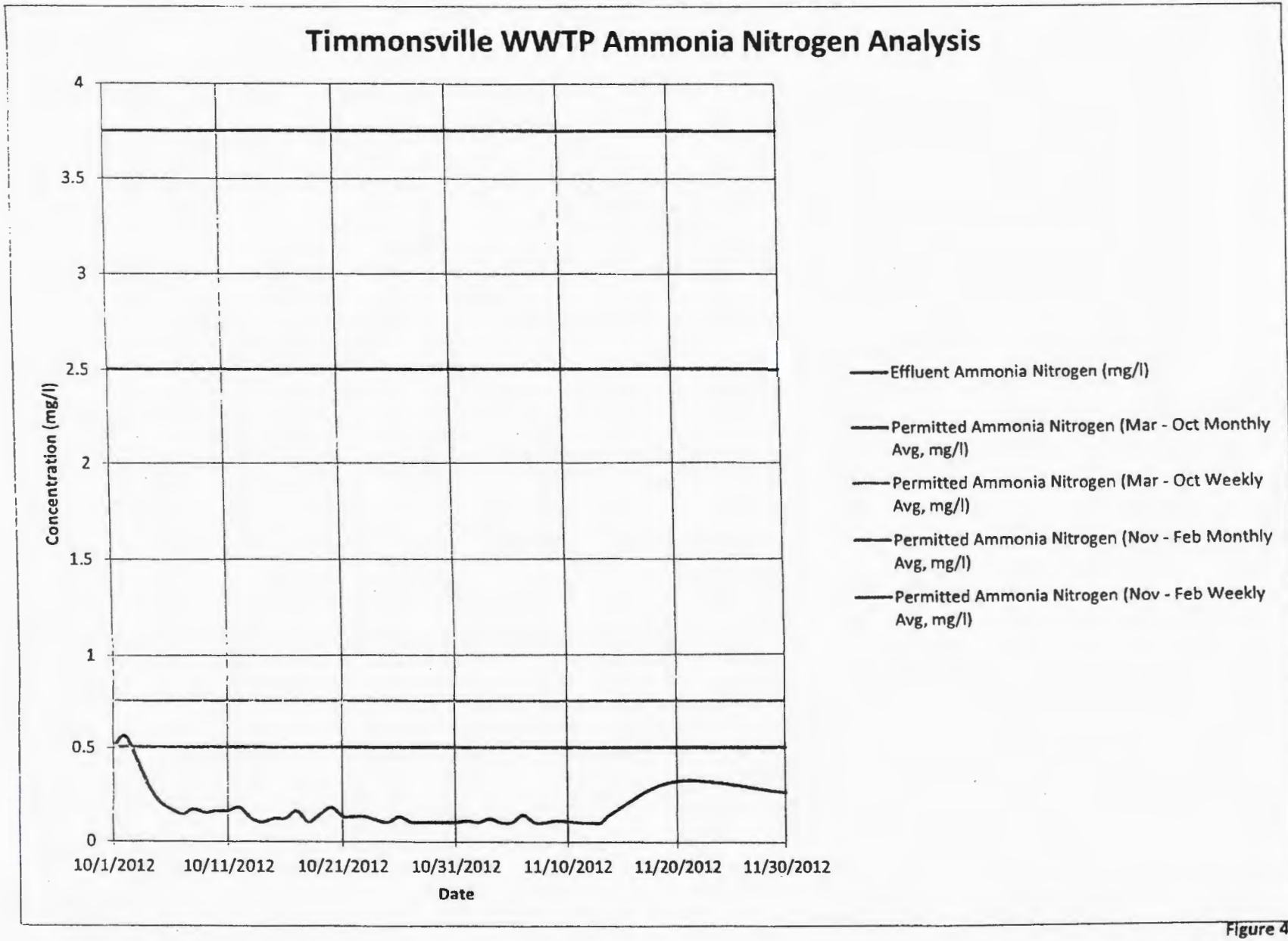


Figure 4-7

Timmonsville WWTP CPE

Ammonia Nitrogen Analysis

Table 4-3 Scoring of the Completely Mixed Aeration Lagoon Capacity

Criteria	Value	Score
Hydraulic Detention Time, hr	40.7	10
Organic Loading, lb/d/1,000 ft3	0.054	10
Oxygen Availability, kg O2/kg BOD Load	131	10
Total Score		30

With a total score of 30 points, the Timmonsville WWTP falls within a Type 1 plant since the plant does not contain a secondary clarifier or a sludge handling system. The Type 1 classification is defined as having adequate major unit processes to achieve required effluent. Therefore, the major problems are related to plant operation and maintenance, and other problems that can be corrected with minor modifications.

- The facultative lagoon capacity calculations indicate that sufficient BOD_5 concentrations can be met and fall below more stringent permitted requirements of 7 mg/L in the months of March through October. Therefore, BOD_5 limits can be achieved with proper maintenance of the facultative lagoons.
- The aeration capacity analysis indicates that firm capacity is sufficient for maximum day oxygen demands in Completely Mixed Cell No. 1.
- The intermittent sand filters should be able to polish effluent to meet NH_4-N and TSS limits due to the hydraulic loading rate falling right around the recommended values. However, this assumed adequate pH and proper operation and maintenance with regular raking and replacement of new filter media when clogging begins to occur.
- The chlorine contact basins meet the minimum required contact time of 30 minutes for average daily flow when both basins are in service. Contact time is 14.8 minutes at 5 mgd with both basins in service or with two basins in service at 50% of the peak flow.

4.6 References

Cairncross & Feachem, Environmental Health Engineering in the Tropics, Wiley: 1993. Pgs. 168-170.

CDM Smith, Activated Sludge Guidelines, 2007.

EPA, Stabilization Ponds, FWS, Constructed Wetlands, and Other Aquatic Systems, 2002a, TFS-40.

EPA, Wastewater Technology Fact Sheet: Aerated, Partial Mix Lagoons, 2002b, EPA-832-F-02-008.

EPA, Handbook of Improving POTW Performance Using the Composite Correction Program Approach, 1984, EPA-625/6-84-008.

EPA, Design Manual: Municipal Wastewater Stabilization Ponds, 1983, EPA-625/1-83-015.

Kayombo, S., Mbwette, T.S.A., Katima, J.H.Y., Ladegaard, N., Jorgensen, S.E., Waste Stabilization Ponds and Constructed Wetlands Design Manual, UNEP-IETC, Danish International Development Agency: 2004.

Rich, L.G. Technical Note No. 2, Aerated Lagoons, Office for Continuing Engineering Education, Clemson University, SC: 1993a.

Rich, L.G. Technical Note No. 6, Nitrification in Aerated Lagoons and with Intermittent Sand Filters, Office of Continuing Engineering Education, Clemson University, SC: 1993b.

Section 5

Administration, Maintenance and Operations

The evaluation of process performance, physical facility design criteria, plant hydraulics, and process modeling results presented in previous sections addresses performance potential and constraints of the physical facilities. The identification of performance limiting factors focuses on administration, operations, and maintenance of the facility to determine if current practices adversely impact or provide a potential to adversely impact performance.

The CPE process features assessment of individual administration, operation and maintenance factors and assignment of a rating factor as described below:

Rating	Adverse Effect of Factor on Plant Performance
A	Major effect on long-term repetitive basis
B	Minimum effect on a routine basis or major effect on a periodic basis
C	Minor effects or potential effect
NR	No rating; factor has no potential to affect

The following sections address the various factors evaluated and present the rating for the WWTP. The evaluations found within this section pertain to the administration, operation, and maintenance practices while the WWTP was owned and operated by the Town of Timmonsville. They do not reflect the performance of similar practices utilized by the City of Florence.

5.1 Administration

Manpower

The Timmonsville WWTP is minimally staffed with a single operator on-site. During off days the operator will check the plant as necessary or if a major operation is being conducted at the site (bypass pumping, etc.). The Timmonsville operator seemed to have adequate wastewater experience and was knowledgeable of the WWTP processes and operations. There did not seem to be any evidence of an existing staffing plan. Due to the overall size of the plant site, and the location of the influent pump station relative to the main WWTP, a single operator on-site could be hard pressed to meet the entire plant demands. Overall, the Timmonsville WWTP has less than adequate manpower to perform necessary duties to operate and maintain the facility at all times.

Factor	Rating
Administration – Man Power	B
a. Number	B
b. Plant Coverage	B
c. Workload Distribution	B
d. Personnel Turnover	C

Morale

Through CDM Smith's informal discussions with Timmonsville plant staff, it is our opinion that morale has been affected by a decrease in motivation due to the deteriorating condition of the plant and the feeling of lack of plant staff support.

Factor	Rating
Administration – Morale	B
a. Motivation	B
b. Pay	NR
c. Work Environment	NR
d. Working Conditions	NR

Staff Qualifications

Based on CDM Smith's informal discussions with Timmonsville staff, it is our opinion that staff possesses the required level of expertise and knowledge to perform their jobs to expectations. Generally, staff is experienced in the day-to-day operations of the plant and capable of executing any task associated with its operations.

Factor	Rating
Administration – Staff Qualifications	C
a. Aptitude	C
b. Level of Education	C
c. Certifications	C

Productivity

Through informal discussions with Timmonsville plant staff it was determined that the productivity of staff is average. The facility does not seem to be staffed to meet the objectives of the treatment needs of the plant. This is evident in the condition and upkeep of the existing equipment throughout the plant.

Factor	Rating
Administration – Productivity	B

Financial

Based on the condition of the equipment throughout the plant, it is our opinion that the facility previously lacked funding to pay for reasonable, responsible capital projects, and preventative maintenance activities when owned and operated by the Town of Timmonsville. At the WWTP, monies do not seem to be available to fund required maintenance or repairs; spare parts and inventories seem to be minimally maintained.

Factor	Rating
Administration – Financial	A
a. Insufficient Funding	A
b. Unnecessary Expenditures	NR
c. Bond Indebtedness	NR

5.2 Maintenance

Maintenance Responsibilities

Maintenance at the Timmonsville WWTP is performed by one or two operators on an as needed basis. The WWTP lacks a comprehensive asset management system that would be used to plan and track maintenance related items. Plant operations personnel are responsible for the upkeep, calibration, and adjustment of operations-specific equipment such as analyzers, meters, etc. The facility is a basic lagoon type wastewater treatment system and as such has fewer maintenance intensive processes than a typical conventional wastewater treatment plant. Furthermore, since various mechanical equipment have failed and are currently not in service, maintenance responsibilities around the plant have decreased since the upgrades in 2008. Waste hauling, to haul screenings from the Headworks, has been terminated for several years due to the failure of the screening equipment (mechanical bar screen and grit system).

Preventative Maintenance

Based on informal discussions with Timmonsville plant staff, preventative maintenance is rarely accomplished and there is currently no asset management system in place. Preventative maintenance is performed by staff where possible and if the necessary parts are available. Preventative maintenance is generally performed on the equipment at the WWTP that have not experienced catastrophic failure.

Factor	Rating
Maintenance – Preventative	A
a. Effective/Formal Program	A
b. Spare Parts Inventory	A

Corrective Maintenance

Corrective maintenance, or unplanned maintenance, is performed in the event of an equipment malfunction. There is no formal process within the Town of Timmonsville to generate work orders for corrective maintenance scenarios. A plant operator assesses the criticality of the repair and performs the repair if possible. Most of the time plant staff hire the services of a contractor, skilled to do the work, to make repairs to the existing equipment.

Factor	Rating
Maintenance – Corrective	A
a. Procedures	A
b. Critical Parts Procurement	A

Maintenance Summary

In general, through CDM Smith's visual assessment and discussions with staff, we found the plant to be poorly maintained by the Town of Timmonsville and in poor or in some cases disrepair; equipment to be in poor working condition; staff to be disengaged and unable to perform to their abilities. Staff seemed to be knowledgeable about the plant and its processes; however staff lacked the necessary resources to perform their duties.

Factor	Rating
Maintenance – General	A
a. Housekeeping	A
b. Staff Expertise	NR
c. Technical Guidance (Maintenance)	NR
d. Equipment Age	NR

5.3 Operations

Process Monitoring and Testing

The Timmonsville WWTP does not have a means to provide sampling and analysis monitoring and testing at the facility. Instead, sampling and analysis is typically performed by firms, hired by the Town of Timmonsville, that are capable of performing these duties. The WWTP does not have a centralized system, such as a supervisory control and data acquisition (SCADA) system, used to track trending for flows, loads and individual process performance that are typically found at a majority of WWTP's today. As such, record data for process parameters of the influent and effluent wastewater are minimal, as outlined in Section 4 of this report. As indicated in Section 3, the Effluent Parshall flume can handle peak flow conditions based on the model results performed. Influent and effluent samplers are installed at the Influent Pump Station and Effluent Parshall flume, respectively. The samplers appear to be in good condition and could be used to analyze influent and effluent parameters such as TSS, which are important for NPDES permit requirements. Based on discussions with plant staff and field observations, the samplers are operating, however data is not being recorded for process monitoring purposes. As discussed in Section 2, a magnetic type flow meter was installed at the Influent Pump Station as part of the upgrades in 2008. Flow measurements from the magnetic flow meter are sent to a chart recorder located in the pump station building. The chart recorder seemed to be recording influent flow data during the field inspection.

Factor	Rating
Operation – Testing	A
a. Performance Monitoring	A
b. Process Control Testing	NR

Process Control Adjustments

As previously mentioned, the Timmonsville WWTP does not have a centralized system to monitor and track process parameters at the facility. Based on informal discussions with plant staff, there are no standard operating procedures (SOPs) in place as a general plan in the event a decision needs to be made due to a process related issue. The decision making process is typically accomplished by making

in-the-field observations and reducing the affects downstream as much as possible. For example, as discussed in Section 2, in the instance the filters are clogged and cannot accept wastewater from the partial mix cells, the filters are bypassed and sent directly to the chlorine contact chamber. In the past, plant staff have sent the unfiltered water to the storage lagoon located west of the intermittent sand filters, however, the storage lagoon is unpermitted and as such the operation has ceased.

In addition to the lack of monitoring, the plant contains a minimal amount of automation. Pump operation based on wetwell level and chlorination/dechlorination chemical feed rate controls are examples of processes that are automated. Due to the basic treatment processes at the WWTP, and the lack of solids handling capabilities, the deficiencies in automation does not appear to be a problem.

Factor	Rating
Operation – Process Control Adjustments	NR
a. Wastewater Treatment Understanding	NR
b. Application of Concepts and Testing to Process Control	NR

O&M Manuals/Procedures

During site observations and through discussions with plant staff, operations and maintenance resource information is limited. SOPs and other written guidance necessary to carry out day-to-day duties for specific tasks are relatively non-existent. O&M manuals and information (drawings, specifications, etc.) from the original plant construction in 1987 and the upgrades in 2008 are not provided at the plant site.

Factor	Rating
Operation – O&M Manuals/Procedures	A
a. Adequacy	A
b. Use	A

5.4 Summary

To summarize, the Timmonsville WWTP's administration, maintenance, and operations practices, when the facility was owned and operated by the Town of Timmonsville, were found to have adverse impacts on WWTP performance. This is evident in the condition of the majority of the plant process equipment. Implementation of the City of Florence's procedures and protocols for administration, maintenance and operation of WWTPs will promptly improve the facility, and this will be addressed in the CCP.

Several areas of improvement are required, and are summarized below:

- Implementation of a monitoring, analysis and subsequent record keeping program.
- Implementation of official SOPs for routine operations and in the event of a mechanical or process failure or discharge violation.
- Provide up-to-date O&M manuals at the WWTP as well as record information such as specifications and drawings.

- Provide funding necessary to replace the existing WWTP equipment that have failed.
- Provide funding necessary to purchase special tools, spare parts, and appurtenances that will allow operators to perform day-to-day maintenance and operational duties.
- Rehabilitate existing process basins by removing sludge and replacing mechanical aerators.
- Rehabilitate existing filters by replacing the existing sand with new.

Section 6

CPE Summary

6.1 Summary

Section 2 through 5 provides a summary of the CPE performed on the Timmonsville WWTP. Included are physical facilities evaluations, process performance evaluations, NPDES compliance summaries, mass balances, flow analyses, hydraulic analyses, process modeling results, and an evaluation of the WWTP's administration, maintenance, and operation. To summarize:

- The WWTP was not previously adequately operated and maintained by the Town of Timmonsville; however, staff seems capable to perform these duties.
- The WWTP, with proper operation and maintenance, is capable of consistent compliance with currently applicable NPDES permit requirements based on the assumptions made in Section 4 of this report.
- The WWTP, with proper operation and maintenance, is capable of handling permitted average daily flows and design peak flows without experiencing prohibited bypass as outlined in the CD.
- Limited capital upgrades to the WWTP (i.e. replace non-functional equipment, replace sand media in filters, etc.) will enhance process performance, reliability, and permit compliance.

Sections 3 and 4 of this report indicate that the plant has the hydraulic capacity and biological treatment capability to meet NPDES permit parameters. Effluent violations, based on the data provided, seem to occur due to the lack of maintaining plant processes and equipment, most notably the intermittent sand filters. Therefore, the Timmonsville WWTP would be designated as a Type 1 plant as outlined in the USEPA document "Improving POTW Performance Using the Composite Correction Approach". A summary of a Type 1 plant as explained in the document is provided below:

- Type 1 – Are those plants where a CPE shows that current performance difficulties are not caused by limitations in the size or capabilities of the existing major unit processes. In these cases, the major problems are related to the plant operation, maintenance, or administration, or to problems that can be corrected with only minor facility modifications.

A summary of performance limiting factors with CPE ratings and recommended CCP actions for the WWTP is provided in **Table 6-1**.

Table 6-1 CPE Summary of WWTP Performance Issues – Timmonsville WWTP

Process	Current Performance Issues	Future Issues	Potential Impact(s)	CPE Rating[1]	Short-Term Actions	CCP Elements
Influent Pumping	Mechanical wear and tear affecting pump performance.	✓	Pump failure.	B	N/A	Evaluate rehabilitation options.
Screening	Screening equipment has failed.	✓	Rags, debris not removed from system and can damage and/or clog downstream equipment and decrease biological process capacities.	B	N/A	Evaluate rehabilitation options.
Grit Removal	Grit removal equipment has failed.	✓	Grit not removed from system and can damage and/or clog downstream equipment and decrease biological process capacities.	B	N/A	Evaluate rehabilitation options.
Biological Treatment	Excess algae leaving biological treatment and entering sand filters due to poor aeration.	✓	Clogging of filters resulting in bypassing of filters causing NPDES permit violations.	B	N/A	Evaluate alternatives to reduce algae accumulation in biological treatment process.
Intermittent Sand Filters	The sand filter media is clogged.	✓	Unable to use filters to treat wastewater creating NPDES permit violation.	A	The sand media will be replaced	Evaluate rehabilitation options.
	Several mud valves on sand filter distribution lines do not work properly.	✓	Unable to utilize entire filter area.	B	The mud valves will be replaced.	Evaluate rehabilitation options and develop preventative maintenance program.
Misc. Process Monitoring & Control	Lack of Automation at the WWTP.	✓	Reliability concerns.	C	N/A	Evaluate the feasibility of additional automation at the WWTP.
	Lack of Central Data Monitoring and Record System.	✓	Cannot track the performance of the WWTP and accurately report NPDES permit violations.	A	N/A	Evaluate the feasibility of implementing a data monitoring system.
Administration, Maintenance, and Operations	Lack of Routine and Preventative Maintenance.	✓	Equipment and subsequent process malfunction.	A	N/A	Evaluate the implementation of SOPs for routine and preventative maintenance.
	Lack of Operator Training.	✓	Poor plant performance.	B	N/A	Evaluate the implementation of an official operator training program.
	Lack of O&M Manuals, Record Data, and SOPs	✓	Poor plant performance.	B	N/A	Evaluate the implementation of a centralized record system.

(1) A = Major Effect – long-term repetitive basis. B = Minimum Effect – routine basis, or major effect – periodic basis. C – Minimum effect.

Section 7

Composite Correction Program Plan

7.1 Overview

The Composite Correction Program (CCP) is the performance improvement phase of the CPE and its objective is to develop a systematic plan to improve performance of the Timmonsville WWTP to enable it to consistently comply with NPDES permit requirements. Specifically, the CCP must:

1. Address all factors which limit or which could limit the WWTP operating efficiency or ability to achieve NPDES permit compliance.
2. Address the administration, maintenance, and operational issues that hinder the WWTP performance.
3. Identify specific actions and schedules to correct each performance limiting factor, including capital improvement to the existing WWTP where appropriate.

The CCP approach for the plant was determined by the CPE rating (Type 1) as indicated in Section 6. The primary performance limiting factors for the WWTP relate to the administration, maintenance, operation, and capital improvements to meet currently applicable NPDES permit requirements under these conditions. These deficiencies will be the focus of the CCP. Other performance limiting factors associated with the plant will be addressed as ancillary improvements associated with major, minor and/or routine improvements.

7.2 Approach

The approach to implementing the CCP for the Timmonsville WWTP will be to meet the existing limits established in NPDES Permit No. SC0025356. To the extent possible, the CCP will be consistent with EPA publications "Improving POTW Performance Using the Composite Correction Approach" and "Retrofitting POTW's", as outlined in the CD. The CCP will focus on Type 1 and 2 remedial actions that are designed toward achieving NPDES permit compliance, eliminating factors that could limit the WWTP's operating efficiency, and evaluating capital improvements projects to increase WWTP performance. The CCP will address administration, maintenance, and operational issues by proposing a protocol for proper day-to-day plant implementation of operations and routine preventative maintenance activities.

7.3 CCP Implementation Schedule

The completed CCP will be submitted to EPA within six months after EPA and SCDHEC approval of the CPE. The CCP will provide a proposed schedule for implementing the recommended actions for the facility.

Appendix A

NPDES Permit

D H E C
PROMOTE PROTECT PROSPER
Catherine B. Templeton, Director
Promoting and protecting the health of the public and the environment

January 23, 2014

Mr. Andrew H. Griffin, City Manager
City of Florence
324 West Evans St.
Florence, SC 29501-0324

Re: Transfer of Ownership
Town of Timmonsville WWTP – SC0025356
Florence County

Dear Mr. Griffin:

The Department has received the request to transfer ownership of the Town of Timmonsville WWTP dated January 9, 2014. This letter is to acknowledge the transfer of ownership and maintenance responsibilities of the above referenced WWTP to the City of Florence. Attached to this letter is a NPDES cover page for SC0025356. Please note that the existing permit as issued by EPA Region IV is in effect with the change in ownership and will remain in effect until the Department completes its review for permit requirements to be included in a reissued permit in the near future.

If you have any questions concerning this issue, please do not hesitate to contact me at montebmj@dhec.sc.gov or at (803) 898-4228.

Sincerely,

Michael J. Montebello, Manager
Domestic Wastewater Permitting Section
Water Facilities Permitting Division

bg
cc: The Honorable Darrick Jackson, Mayor, Town of Timmonsville
Michael Hemmingway, Utilities Director, City of Florence
Buck Graham, Pee Dee BEHS Florence
Jeff deBessonet
Enforcement
State File

Attachment: SC0025356 Cover Page

Surface Water Discharge Permit

In Accordance With the
National Pollutant Discharge Elimination System (NPDES)

This NPDES Permit Certifies That

CITY OF FLORENCE
Town of Timmonsville WWTP

has been granted permission to discharge treated wastewater from a facility located at

706 South Hill Street in
Florence County

to receiving waters named

Sparrow Swamp to Lynches River

in accordance with effluent limitations, monitoring requirements and other conditions set forth in Parts I, II, III, IV and V hereof. This permit is issued in accordance with the provisions of the Pollution Control Act of South Carolina (S.C. Code Sections 48-1-10 et seq., 1976), Regulation 61-9 and with the provisions of the Federal Clean Water Act (Pl. 92-500), as amended, 33 U.S.C. 1251 et seq., the "Act."

Jeffrey P. deBessonet, P.E., Director
Water Facilities Permitting Division
Bureau of Water

Issued: August 31, 2006

Expires[1]: August 31, 2008

Effective: October 1, 2006

Permit No.: SC0025356

Ownership Transfer Date: January 9, 2014

This permit will continue to be in effect beyond the expiration date if a complete timely re-application is received pursuant to Regulation 61-9.122.6 and signed per Regulation 61-9.122.22

D H E C
PROMOTE PROTECT PROSPER
South Carolina Department of Health and Environmental Control

DISCLAIMER

The full text of certain NPDES permits and the associated fact sheets has been made available to provide online access to this public information. EPA is making permits and fact sheets available electronically to provide convenient access for interested public parties and as a reference for permit writers. The ownership of these documents lies with the permitting authority, typically a State with an authorized NPDES program.

While EPA makes every effort to ensure that this web site remains current and contains the final version of the active permit, we cannot guarantee it is so. For example, there may be some delay in posting modifications made after a permit is issued. Also note that not all active permits are currently available electronically. Only permits and fact sheets for which the full text has been provided to Headquarters by the permitting authority may be made available. Headquarters has requested the full text only for permits as they are issued or reissued, beginning November 1, 2002.

Please contact the appropriate permitting authority (either a State or EPA Regional office) prior to acting on this information to ensure you have the most up-to-date permit and/or fact sheet. EPA recognizes the official version of a permit or fact sheet to be the version designated as such and appropriately stored by the respective permitting authority.

The documents are gathered from all permitting authorities, and all documents thus obtained are made available electronically, with no screening for completeness or quality. Thus, availability on the website does not constitute endorsement by EPA.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

AUG 3 1 2006

Honorable Henry B. Peoples, Mayor
Town of Timmonsville
706 South Hill Street
Timmonsville, SC 29161

SUBJ: Final Issuance of NPDES Permit No. SC0025356
Town of Timmonsville WWTP

Dear Mayor Peoples:

Enclosed is the National Pollutant Discharge Elimination System (NPDES) permit for the above-referenced facility. Pursuant to the Clean Water Act, the State has provided Section 401 certification, the requirements of which are attached to and become an enforceable part of the permit. The permit shall become effective as indicated on the cover page, unless, within thirty (30) days following the date you receive the permit, you petition the Environmental Appeals Board (EAB) to review any conditions of the permit in accordance with the provisions of Title 40, Code of Federal Regulations Section 124.19, which is enclosed.

All pleadings filed by mail must be addressed to the Environmental Protection Agency, Clerk of the Board, Environmental Appeals Board (MC 1103B), Ariel Rios Building, 1200 Pennsylvania Avenue, N.W., Washington, DC 20460. Documents that are hand-delivered must be delivered to the EAB offices at Colorado Building, 1341 G Street N.W., Suite 600, Washington, DC 20005. Documents may be filed with the Clerk of the Board only between the hours of 8:30 a.m. and 4:30 p.m. Eastern Standard Time, Monday through Friday (excluding Federal holidays). The website for the EAB is http://www.epa.gov/eab. The webpage's Frequently Asked Questions deal with filing issues, which you may want to refer to regarding the permit appeal process.

The preprinted Discharge Monitoring Report (DMR) Forms for the enclosed permit are being processed and will be mailed to you before the due date of the first DMR. These forms should be used to report all discharge data at the frequency required in your permit. If you have not received these preprinted forms prior to the end of the first monitoring period, please contact Mike Donehoo at (404) 562-9745.

If you have any questions regarding the permit, please direct them to Cheryl Espy, Permit Writer, at (404) 562-9342, or for any information on procedures pertaining to legal matters relative to this permit issuance, contact Mr. Philip Mancusi-Ungaro, Attorney-Advisor, at (404) 562-9519.

Sincerely,

James D. Giattina, Director
Water Management Division

Enclosures (3)
1. Evidentiary Hearing Procedures
2. Final NPDES Permit
3. Amendment to Fact Sheet .

cc: SCDHEC (with all enclosures, except Permit Appeal Procedures)
U.S. Fish & Wildlife Service, (with all enclosures, except Permit Appeal Procedures)
B.P. Barber & Associates, Inc. (with all enclosures, except Permit Appeal Procedures)

ENVIRONMENTAL PROTECTION AGENCY
REGION 4

PERMITS, GRANTS, AND TECHNICAL ASSISTANCE BRANCH
WATER MANAGEMENT DIVISION

APPEAL OF NPDES PERMITS

The following is a list of acronyms/abbreviations used:

EPA	Environmental Protection Agency
NPDES	National Pollutant Discharge Elimination System
PSD	Prevention of Significant Deterioration
UIC	Underground Injection Control
U.S.C.	United States Code

The following regulation discusses the appeal procedures for NPDES permits and is cited from the regulations as found in Title 40, Code of Federal Regulations (40 CFR) Part 124--Procedures for Decisionmaking, Subpart A-General Program Requirements, Volume 20, pages 283-284, revised as of July 1, 2004.

Section 124.19 Appeal of RCRA, UIC, NPDES, and PSD Permits.

(a) Within 30 days after a RCRA, UIC, NPDES, or PSD final permit decision (or a decision under 270.29 of this chapter to deny a permit for the active life of a RCRA hazardous waste management facility or unit) has been issued under Section 124.15 of this part, any person who filed comments on that draft permit or participated in the public hearing may petition the Environmental Appeals Board to review any condition of the permit decision. Persons affected by an NPDES general permit may not file a petition under this section or otherwise challenge the conditions of the general permit in further Agency proceedings. They may, instead, either challenge the general permit in court, or apply for an individual NPDES permit under Section 122.21 as authorized in Section 122.28 and then petition the Board for review as provided by this section. As provided in Section 122.28(b)(3), any interested person may also petition the Director to require an individual NPDES permit for any discharger eligible for authorization to discharge under an NPDES general permit. Any person who failed to file comments or failed to participate in the public hearing on the draft permit may petition for administrative review only to the extent of the changes from the draft to the final permit decision. The 30-day period within which a person may request review under this section begins with the service of notice of the Regional Administrator's action unless a later date is specified in that notice. The petition shall include a statement of the reasons supporting that review, including a demonstration that any issues being raised were raised during the public comment period (including any public hearing) to the extent required by these regulations and when appropriate, a showing that the condition in question is based on:

(1) A finding of fact or conclusion of law which is clearly erroneous, or

(2) An exercise of discretion or an important policy consideration which the Environmental Appeals Board should, in its discretion, review.

(b) The Environmental Appeals Board may also decide on its own initiative to review any condition of any RCRA, UIC, NPDES, or PSD permit decision issued under this part for which review is available under paragraph (a) of this section. The Environmental Appeals Board must act under this paragraph within 30 days of the service date of notice of the Regional Administrator's action.

(c) Within a reasonable time following the filing of the petition for review, the Environmental Appeals Board shall issue an order granting or denying the petition for review. To the extent review is denied, the conditions of the final permit decision become final agency action. Public notice of any grant of review by the Environmental Appeals Board under paragraph (a) or (b) of this section shall be given as provided in Section 124.10. Public notice shall set forth a briefing schedule for the appeal and shall state that any interested person may file an amicus brief. Notice of denial of review shall be sent only to the person(s) requesting review.

(d) The Regional Administrator, at any time prior to the rendering of a decision under paragraph (c) of this section to grant or deny review of a permit decision, may, upon notification to the Board and any interested parties, withdraw the permit and prepare a new draft permit under Section 124.6 addressing the portions so withdrawn. The new draft permit shall proceed through the same process of public comment and opportunity for a public hearing as would apply to any other draft permit subject to this part. Any portions of the permit which are not withdrawn and which are not stayed under Section 124.16(a) continue to apply.

(e) A petition to the Environmental Appeals Board under paragraph (a) of this section is, under 5 U.S.C. 704, a prerequisite to the seeking of judicial review of the final agency action.

(f) (1) For purposes of judicial review under the appropriate Act, final agency action occurs when a final RCRA, UIC, NPDES, or PSD permit decision is issued by EPA and agency review procedures under this section are exhausted. A final permit decision shall be issued by the Regional Administrator:

(i) When the Environmental Appeals Board issues notice to the parties that review has been denied;

(ii) When the Environmental Appeals Board issues a decision on the merits of the appeal and the decision does not include a remand of the proceedings; or

(iii) Upon the completion of remand proceedings if the proceedings are remanded, unless the Environmental Appeals Board's remand order specifically provides that appeal of the remand decision will be required to exhaust administrative remedies.

(2) Notice of any final agency action regarding a PSD permit shall promptly be published in the Federal Register.

(g) Motions to reconsider a final order shall be filed within ten (10) days after service of the final order. Every such motion must set forth the matters claimed to have been erroneously decided and the nature of the alleged errors. Motions for reconsideration under this provision shall be directed to, and decided by, the Environmental Appeals Board. Motions for reconsideration directed to the administrator, rather than to the Environmental Appeals Board, will not be considered, except in cases that the Environmental Appeals Board has referred to the Administrator pursuant to Section 124.2 and in which the Administrator has issued the final order. A motion for reconsideration shall not stay the effective date of the final order unless specifically so ordered by the Environmental Appeals Board.

[48 FR 14264, Apr. 1, 1983, as amended at 54 FR 9607, Mar. 7, 1989; 57 FR 5335, Feb. 13, 1992; 65 FR 30911, May 15, 2000]

Permit No. SC0025356
Major POTW

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Clean Water Act, as amended (33 U.S.C. 1251 et seq.; the "Act"), the

Town of Timmonsville
P.O. Box 447
Timmonsville, SC 29161

is authorized to discharge from a facility located at

706 South Hill Street
Florence County

to receiving waters named

Sparrow Swamp to Lynches River

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein. The permit consists of this cover sheet, Part I 8 pages, Part II 17 pages, Part III 5 pages, Part IV 2 pages, and attached State Certification requirements 8 pages.

This permit shall become effective on October 1, 2006.

This permit and the authorization to discharge shall expire at midnight August 31, 2008.

AUG 3 1 2006

Date Issued

James D. Giattina, Director
Water Management Division

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - INTERIM LIMITS FOR 1.29 MGD FACILITY

1. During the period beginning on the effective date of this permit and lasting until the Permittee is authorized to discharge 2.0 MGD, the permittee is authorized to discharge sanitary wastewater from Outfall 001.

Such discharges shall be limited and monitored by the permittee as specified below:

PARAMETERS	DISCHARGE LIMITATIONS			MONITORING REQUIREMENTS*		
	MONTHLY AVG	WEEKLY AVG	DAILY MAXIMUM	SAMPLING POINT(s)	MEASUREMENT FREQUENCY	SAMPLE TYPE
Flow, MGD[1]	1.29	1.29	---	Effluent	Daily	Continuous
Stream Flow, cfs[2] (Mar - Oct)	—	—	Report	In-Stream	Daily	Instantaneous
Dilution Ratio, (Stream Flow:WWTP Flow)[2]	0.57:1 Minimum at all times (Mar-Oct) 0.0:1 Minimum at all times (Nov-Feb)			—	Daily	Calculated
Flow, MGD (Discharge to Stream)[2]	—	—	17.0	Effluent	Daily	Continuous
Biochemical Oxygen Demand 5-Day (BOD_5), mg/l	Report	—	—	*Influent*	1/Discharge Week♦	Grab
Biochemical Oxygen Demand 5-Day (BOD_5), mg/l (lbs/day)	10.0 (108.0)	15.0 (162.0)	—	Effluent	1/Discharge Week♦	24-hour Composite
BOD_5, percent removal[3]	65% Minimum	—	—	—	1/Month	Calculated
Total Suspended Solids (TSS), mg/l	Report	—	---	*Influent*	1/Discharge Week♦	Grab
Total Suspended Solids (TSS), mg/l (lbs/day)	90.0 (968.0)	135.0 (1452.0)	—	Effluent	1/Discharge Week♦	24-hour Composite
TSS, percent removal[3]	65% Minimum	---	—	—	1/Month	Calculated

* During discharge: Report volume discharged per day; Composite sample shall be up to 24 hours

Note: The dilution ratio is determined from critical streamflow conditions and the discharging of treated wastewater to the stream. Discharges occur when the streamflow is sufficient to assimilate the treated wastewater from the facility.

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - INTERIM LIMITS (CONTINUED)

PARAMETERS	DISCHARGE LIMITATIONS			MONITORING REQUIREMENTS		
	MONTHLY AVG	WEEKLY AVG	DAILY MAXIMUM	SAMPLING POINT(s)	MEASUREMENT FREQUENCY	SAMPLE TYPE
Ammonia Nitrogen (NH_3-N), mg/l (lbs/day) March - October	1.0 (11.0)	1.5 (16.0)	—	Effluent	1/Discharge Week[4]♦	24-hour Composite
Ammonia Nitrogen (NH_3-N), mg/l (lbs/day) November - February	1.5 (16.0)	2.25 (24.0)	—	Effluent	1/Discharge Week[4]♦	24-hour Composite
Dissolved Oxygen, mg/l	6.0 mg/l minimum at all times			Effluent	Daily	Grab
pH, standard units (SU)	6.0 - 8.5			Effluent	Daily	Grab
Chronic Whole Effluent Toxicity, IC_{25}	>100%	—	—	Effluent	See Part IV	
Fecal Coliform Bacteria, #/100 ml[5]	200	—	400	Effluent	1/Discharge Day★	Grab
Total Recoverable Copper, mg/l	0.018	---	0.025	Effluent	1/Quarter	24-hour Composite
Total Recoverable Arsenic, mg/l	0.0078	---	0.0114	Effluent	1 /Quarter	24-hour Composite
Total Recoverable Mercury, mg/l*	Report	—	Report	Effluent	2/Year	Grab
Total Residual Chlorine, mg/l	0.011	—	0.019	Effluent	1/Discharge Day★	Grab

1 - See Item 3 on Page I-5 for Flow Measurement Location
2 - See Item 4 on Page I-5 for Stream Measurement Requirements
3 - See Item 5 on Page I-5 for % Removal Requirements
4 - See Item 4 on Page I-5 for Measurement Frequency Requirements
5 - See Item 7 on Page I-5 for Measurement Frequency Requirements
* Total recoverable mercury shall be analyzed using EPA method 1631
.★ No more than 5 samples shall be collected during the week
♦ For multiple discharges during a week, the permittee shall attempt to collect composite samples on a day when the highest discharge for that week is expected.

PART I

B. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - FINAL LIMITS FOR DESIGN FLOW- 2.0 MGD FACILITY

1. During the period beginning 30 days after the facility has expanded to 2.0 MGD, and lasting until the expiration date of this permit, the permittee is authorized to discharge sanitary wastewater from Outfall 001.

Such discharges shall be limited and monitored by the permittee as specified below:

PARAMETERS	DISCHARGE LIMITATIONS			MONITORING REQUIREMENTS		
	MONTHLY AVG	WEEKLY AVG	DAILY MAXIMUM	SAMPLING POINT(s)	MEASUREMENT FREQUENCY	SAMPLE TYPE
Flow, MGD	2.0	2.0	—	Effluent	Daily	Continuous
Biochemical Oxygen Demand 5-Day (BOD_5), mg/l	Report	—	—	*Influent*	1/Week	24-hour Composite
Biochemical Oxygen Demand 5-Day (BOD_5), mg/l (lbs/day) March - October	7.5 (125)	11.25 (188)	—	Effluent	1/Week	24-hour Composite
Biochemical Oxygen Demand 5-Day (BOD_5), mg/l (lbs/day) November - February	10.0 (167.0)	15.0 (250.0)	—	Effluent	1/Week	24-hour Composite
BOD_5, percent removal[3]	85% Minimum	—	—	—	1/Month	Calculated
Total Suspended Solids (TSS), mg/l	Report	—	—	*Influent*	1/Week	24-hour Composite
Total Suspended Solids (TSS), mg/l (lbs/day)	30.0 (500.0)	45.0 (750.0)	—	Effluent	1/Week	24-hour Composite
TSS, percent removal[6]	85% Minimum	—	—	—	1 /Month	Calculated
Ammonia Nitrogen, (NH_3-N), mg/l (lbs/day) March - October	0.5 (8.0)	0.75 (12.0)	—	Effluent	1/Week	24-hour Composite
Ammonia Nitrogen, (NH_3-N), mg/l (lbs/day) November - February	2.5 (42.0)	3.75 (63.0)	—	Effluent	1/Week	24-hour Composite

6 - See Item 7 on Page I-5 for % Removal Requirements

PART I

B. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS - FINAL LIMITS (CONTINUED)

PARAMETERS	DISCHARGE LIMITATIONS			MONITORING REQUIREMENTS		
	MONTHLY AVG	WEEKLY AVG	DAILY MAXIMUM	SAMPLING POINT(s)	MEASUREMENT FREQUENCY	SAMPLE TYPE
Dissolved Oxygen, mg/l	6.0 mg/l minimum at all times			Effluent	Daily	Grab
pH, standard units (SU)	6.0 - 8.5			Effluent	Daily	Grab
Chronic Whole Effluent Toxicity, IC_{25}	>100%	—	—	Effluent	See Part IV	
Fecal Coliform Bacteria, #/100 ml	200	—	400	Effluent	1/Week	Grab
Total Recoverable Copper, mg/l	0.015	---	0.021	Effluent	1/Quarter	24-hour Composite
Total Recoverable Arsenic, mg/l	0.0051	---	0.0074	Effluent	1/Quarter	24-hour Composite
Total Recoverable Mercury, mg/l*	0.00005	—	0.004	Effluent	2/Year	Grab
Total Residual Chlorine, mg/l	0.011	—	0.019	Effluent	1/Week	Grab
Total Phosphorus (as P), mg/l	Report	Report	–	–	1/Month	24-hour Composite
Total Nitrogen (as N), mg/l	Report	Report	—	—	1/Month	24-hour Composite

*Total recoverable mercury shall be analyzed using EPA Method 1631.

2. All correspondence (including any report, notice, request for determination, etc.) that is required to be submitted to the Environmental Protection Agency (EPA) shall be submitted to the address specified in Part III, Section A. of this permit. Copies should also be sent to the South Carolina Department of Health and Environmental Control (SCDEHC) at the address specified in Part III, Section A. of this permit.

3. The flow shall be measured at the chlorine contact chamber prior to the storage lagoon or discharge.

4. Stream flow shall be measured by staff gauge and readings shall be recorded daily in an operators log. All readings must be definitive, i.e., greater than (>) values are unacceptable. The permittee shall be responsible for annually maintaining the stream staff gauge calibration through the services of the United States Geological Survey (USGS). The staff gauge will be read once a day at a minimum by an operator and the results recorded. The staff gauge readings recorded during any one month will be submitted along with the discharge monitoring report (DMR) data recorded for the same month. The flow monitoring for the stream must be maintained such that an individual reading can be taken under all flow conditions. During the summer (March - October), the minimum receiving stream flow allowed before the WWTP can discharge is 1.15 cfs. The stream flow read from the staff gauge will be used to calculate the allowable flow that may be discharged to the receiving stream using the following equation:

   (Stream flow (cfs) * 0.6463)/0.57 = Allowable discharge flow (MGD)

   The maximum allowable daily discharge is limited to 17.0 MGD prior to the expansion.

5. In addition to the specified limits in Part I.A.1. the monthly average effluent TSS and BOD_5 concentration shall not exceed 35% of its respective influent value (minimum of 65% removal). The percent removal shall also be reported on the DMR Form (EPA No. 3320-1).

6. In addition to the specified limits in Part I.B.1., the monthly average effluent TSS and BOD_5 concentration shall not exceed 15% of its respective influent value (minimum of 85% removal). The percent removal shall also be reported on the DMR Form (EPA No. 3320-1).

7. The geometric mean of the fecal coliform values collected during any monthly period shall not exceed 200 colonies per 100 ml of effluent sample and shall be reported as the monthly average value on the DMR Form. The daily maximum fecal coliform value shall not exceed 400 colonies per 100 ml of effluent sample and shall be reported as the daily maximum value on the DMR Form.

8. Samples taken in compliance with the monitoring requirements specified in this permit shall be taken at the nearest accessible point after final treatment but prior to the actual discharge or mixing with the receiving waters (unless otherwise specified).

9. Any bypass of the treatment facility, which is not included in the effluent monitored above, is to be monitored for flow and all other parameters, except chronic whole effluent toxicity. For parameters other than flow, at least one grab sample per day shall be monitored.

10. Daily flow shall be monitored or estimated, as appropriate, to obtain reportable data. All monitoring results shall be reported on a DMR Form.

11. There shall be no discharge of floating solids or visible foam in other than trace amounts.

12. The effluent shall not cause a visible sheen on the receiving water.

13. If the results for a given sample analysis are such that any parameter (other than fecal coliform) is not detected at or above the minimum level for the test method used, a value of zero will be used for that sample in calculating an arithmetic mean value for the parameter. If the resulting calculated arithmetic mean value for that reporting period is zero, the permittee shall report "NODI=B" on the DMR Form. For fecal coliform, a value of 1.0 shall be used in calculating the geometric mean. If the resulting fecal coliform mean value is 1.0, the permittee shall report "NODI=B" on the DMR Form. For each quantitative sample value that is not detectable, the test method used and the minimum level for that method for that parameter shall be attached to and submitted with the DMR Form. The permittee shall then be considered in compliance with the appropriate effluent limitation and/or reporting requirement.

14. Overflow identification: The permittee shall identify all wastewater discharges, at locations not authorized as permitted outfalls, that occur prior to the headworks of the wastewater treatment plant covered by this permit. The permittee shall submit, with the scheduled DMR Form, the following information for each discharge event at each source that occurs during the reporting period covered by the DMR Form:

    1. the cause of the discharge;
    2. duration and volume (estimate if unknown);
    3. description of the source, e.g., manhole cover, pump station;
    4. type of collection system that overflowed, i.e., combined or separate;
    5. location by street address, or any other appropriate method;
    6. date of event;
    7. the ultimate destination of the flow, e.g., surface water body, land use location, via municipal separate storm sewer system to a surface water body, (show location on a USGS map or copy thereof); and
    8. corrective actions or plans to eliminate future discharges.

    The permittee shall refer to Part II.D.8 of this permit which contains information about reporting unpermitted discharge events. Submittal or reporting of any of this information does not provide relief from any subsequent enforcement actions for unpermitted discharges to waters of the United States.

C. SLUDGE MANAGEMENT PRACTICES

1. The permittee shall comply with all existing federal laws and regulations that apply to sewage sludge use and disposal practices including those provisions of 40 CFR Part 503 and 40 CFR Part 258 which are hereby incorporated as part of the permit by reference, and the Clean Water Act (CWA) Section 405(d) technical standards.

2. The permittee is responsible for assuring that all biosolids produced at its facility are used or disposed of in accordance with the applicable federal law or regulation, whether the permittee uses or disposes of the biosolids itself or transfers them to another party for further treatment, use, or disposal. The permittee may be responsible for informing subsequent preparers, appliers, and disposers of the requirements that they must meet under these rules.

3. Duty to mitigate: The permittee shall take all reasonable steps to minimize or prevent any discharge or biosolids use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

4. The permittee may be required to submit an annual sludge report containing the information required in 40 CFR Part 503 by February 19th of each calendar year. The report shall cover the previous calendar year. The report shall be submitted to the U.S. EPA Region 4 and SCDHEC at the addresses provided in Section III.A. of this permit.

D. SCHEDULE OF COMPLIANCE

1. The permittee shall achieve compliance with the effluent limitations specified for discharges in accordance with the following schedule:

Operational Level Attained..... Effective Date of Permit

The following schedule shall be utilized for the 2.0 MGD expansion to meet the effluent limitations in Part B.1. of this permit:

1. Submit reports every 6 months to EPA of progress towards completion of construction, projected completion date with each report, beginning 3 months after effective date of permit issuance.

First Report of Construction Progress.....January 1, 2007
Second Report of Construction Progress.....July 1, 2007
Third Report of Construction Progress.....January 1, 2008
Fourth Report of Construction Progress.....June 1, 2008

2. Operational Level Attained.....July 1, 2008

2. No later than 14 calendar days following a date identified in the above schedule of compliance, the permittee shall submit either a report of progress or, in the case of specific actions being required by identified dates, a written notice of compliance or noncompliance. In the latter case, the notice shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

PART II

STANDARD CONDITIONS FOR NPDES PERMITS

SECTION A. GENERAL CONDITIONS

1. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act (CWA or Act) and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application. The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants and with standards for sewage sludge use or disposal established under Section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions or standards for sewage sludge use or disposal, even if the permit has not yet been modified to incorporate the requirement.

[40 CFR §§ 122.41(a) and 122.41(a)(1)]

2. Penalties for Violations of Permit Conditions

The Clean Water Act provides that any person who violates Section 301, 302, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any such sections in a permit issued under Section 402, or any requirement imposed in a pretreatment program approved under Sections 402(a)(3) or 402(b)(8) of the Act, is subject to a civil penalty not to exceed $32,500 per day for each violation. The Clean Water Act provides that any person who negligently violates Sections 301, 302, 306, 307, 308, 318, or 405 of the Act, or any condition or limitation implementing any of such sections in a permit issued under Section 402 of the Act, or any requirement imposed in a pretreatment program approved under Section 402(a)(3) or 402(b)(8) of the Act, is subject to criminal penalties of $2,500 to $25,000 per day of violation, or imprisonment of not more than 1 year, or both. In the case of a second or subsequent conviction for a negligent violation, a person shall be subject to criminal penalties of not more than $50,000 per day of violation, or by imprisonment of not more than 2 years, or both. Any person who knowingly violates such sections, or such conditions or limitations is subject to criminal penalties of $5,000 to $50,000 per day of violation, or imprisonment for not more than 3 years, or both. In the case of a second or subsequent conviction for a knowing violation, a person shall be subject to criminal penalties of not more than $100,000 per day of violation, or imprisonment of not more than 6 years, or both. Any person who knowingly violates Section 301, 302, 303, 306, 307, 308, 318 or 405 of the Act, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of the Act, and who knows at that time that he thereby places another person in imminent danger of death or serious bodily injury, shall, upon conviction, be subject to a fine of not more than $250,000 or imprisonment of not more than 15 years, or both. In the case of a second or subsequent conviction for a knowing endangerment violation, a person shall be subject to a fine of not more than $500,000 or by imprisonment of not more than 30 years, or both. An organization, as defined in Section 309(c)(3)(B)(iii) of the CWA, shall, upon conviction of violating the imminent danger provision, be subject to a fine of not more than $1,000,000 and can be fined up to $2,000,000 for second or subsequent convictions.

[40 CFR § 122.41(a)(2) and 69 FR 7121]

Any person may be assessed an administrative penalty by the Administrator for violating Section 301, 302, 306, 307, 308, 318 or 405 of this Act, or any permit condition or limitation implementing any of such sections in a permit issued under Section 402 of this Act. Administrative penalties for Class I violations are not to exceed $11,000 per violation, with the maximum amount of any Class I penalty assessed not to exceed $32,500. Penalties for Class II violations are not to exceed $11,000 per day for each day during which the violation continues, with the maximum amount of any Class II penalty not to exceed $157,500.

[40 CFR § 122.41(a)(3) and 69 FR 7121]

The specific amounts for violations reflect those in effect at the time of permit issuance and are subject to change.

3. Civil and Criminal Liability

Except as provided in permit conditions on "Bypassing" Section B, Paragraph 3, and "Upset" Section B, Paragraph 4, nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

[40 CFR § 122.41(m) and (n)]

4. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

[40 CFR § 122.41(d)]

5. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

[40 CFR § 122.41(f)]

6. Toxic Pollutants

If any applicable toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under Section 307(a) of the Clean Water Act for a toxic pollutant and that standard or prohibition is more stringent than any limitation on the pollutant in the permit, the Director shall institute proceedings under these regulations to modify or revoke and reissue the permit to conform to the toxic effluent standard or prohibition.

[40 CFR § 122.44(b)(1)]

7. Oil and Hazardous Substance Liability

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties to which the permittee is or may be subject under Section 311 of the Act.

8. State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation under authority preserved by Section 510 of the Act.

9. Effect of a Permit

Except for any toxic effluent standards and prohibitions imposed under Section 307 of the CWA and "standards for sewage sludge use or disposal" under Section 405(d) of the CWA, compliance with a permit during its term constitutes compliance, for purposes of enforcement, with Sections 301, 302, 306, 307, 318, 403, and 405 (a)-(b) of CWA. However, a permit may be modified, revoked and reissued, or terminated during its term for cause as set forth in 40 CFR §§ 122.62 and 122.64.

Compliance with a permit condition which implements a particular "standard for sewage sludge use or disposal" shall be an affirmative defense in any enforcement action brought for a violation of that "standard for sewage sludge use or disposal" pursuant to Sections 405(e) and 309 of the CWA.

[40 CFR § 122.5(a)]

10. Property Rights

This permit does not convey any property rights of any sort, or any exclusive privilege.

[40 CFR § 122.5(b) & 40 CFR § 122.41(g)]

The issuance of a permit does not authorize any injury to persons or property or invasion of other private rights, or any infringement of State or local law or regulations.

[40 CFR § 122.5(c)]

11. Onshore or Offshore Construction

This permit does not authorize or approve the construction of any onshore or offshore physical structures or facilities or the undertaking of any work in any waters of the United States.

12. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

13. Duty to Provide Information

The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish to the Director upon request, copies of records required to be kept by this permit.

[40 CFR § 122.41(h)]

SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

[40 CFR § 122.41(e)]

2. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

[40 CFR § 122.41(c)]

3. Bypass of Treatment Facilities

a. Definitions

(1) "**Bypass**" means the intentional diversion of waste streams from any portion of a treatment facility.

(2) "**Severe property damage**" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypass not exceeding limitations.

The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Paragraphs c. and d. of this subsection.

c. Notice

(1) **Anticipated bypass.** If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten days before the date of the bypass.

(2) **Unanticipated bypass.** The permittee shall submit notice of an unanticipated bypass as required in Section D, Subsection 8 (24-hour notice).

d. Prohibition of bypass

(1) Bypass is prohibited, and the Director may take enforcement action against a permittee for bypass, unless:

(a) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

(b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

(c) The permittee submitted notices as required under Paragraph c. of this subsection.

(2) The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above in Paragraph d.(1) of this subsection.

[40 CFR § 122.41(m)(1)-(4)]

4. Upsets

a. Definition

"Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

b. Effect of an upset

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of Paragraph c. of this subsection are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset

A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and that the permittee can identify the cause(s) of the upset;

(2) The permitted facility was at the time being properly operated; and

(3) The permittee submitted notice of the upset as required in Section D, Subsection 8 (24 hour notice);

(4) The permittee complied with any remedial measures required under Section A., Subsection 4.

d. Burden of proof

In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

[40 CFR § 122.41(n)(1)-(4)]

5. Removed Substances

This permit does not authorize discharge of solids, sludge, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters of the United States unless specifically limited in Part I.

SECTION C. MONITORING AND RECORDS

1. Representative Sampling

Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

[40 CFR § 122.41(j)(1)]

All samples shall be taken at the monitoring points specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other wastestream, body of water, or substance. Monitoring points shall not be changed without notification to and the approval of the Director.

2. Flow Measurements

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to insure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated and maintained to insure that the accuracy of the measurements are consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than $\pm$ 10% from the true discharge rates throughout the range of expected discharge volumes. Once-through condenser cooling water flow which is monitored by pump logs, or pump hour meters as specified in Part I of this permit and based on the manufacturer's pump curves shall not be subject to this requirement. Guidance in selection, installation, calibration, and operation of acceptable flow measurement devices can be obtained from the following references. These references are available from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161. (800) 553-6847 or (703) 487-4650.

"A Guide to Methods and Standards for the Measurement of Water Flow", U.S. Department of Commerce, National Bureau of Standards, NBS Special Publication 421, May 1975, 100 pp. (Order by NTIS No. COM-7510683.)

"Water Measurement Manual", U.S. Department of Interior, Bureau of Reclamation, Revised Edition, 1984, 343 pp. (Order by NTIS No. PB-85221109.)

"Flow Measurement in Open Channels and Closed Conduits", U.S. Department of Commerce, National Bureau of Standards, NBS Special Publication 484, October 1977, 982 pp. (Order by NTIS No. PB-273535.)

"NPDES Compliance Flow Measurement Manual", U.S. Environmental Protection Agency, Office of Water Enforcement, Publication MCD-77, September 1981, 149 pp. (Order by NTIS No. PB-82131178.)

3. Monitoring Procedures

Monitoring results must be conducted according to test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, unless other test procedures have been specified in the permit.

[40 CFR § 122.41(j)(4)]

4. Penalties for Tampering

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than 4 years, or both.

[40 CFR § 122.41(j)(5)]

5. Retention of Records

Except for records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR Part 503), the permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

[40 CFR § 122.41(j)(2)]

6. Record Contents

Records of monitoring information shall include:

a. The date, exact place, and time of sampling or measurements;
b. The individual(s) who performed the sampling or measurements;
c. The date(s) analyses were performed;
d. The individual(s) who performed the analyses;
e. The analytical techniques or methods used; and
f. The results of such analyses.

[40 CFR § 122.41(j)(3)(i)-(vi)]

7. Inspection and Entry

The permittee shall allow the Director, or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon presentation of credentials and other documents as may be required by law, to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

[40 CFR § 122.41(i)(1)-(4)]

SECTION D. REPORTING REQUIREMENTS

1. Change in Discharge

Planned changes. The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

a. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR § 122.29(b); or

b. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under Section D, Subsection 11.

c. The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

[40 CFR § 122.41(l)(1)(i)-(iii)]

2. Anticipated Noncompliance

The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

[40 CFR § 122.41(l)(2)]

Any maintenance of facilities, which might necessitate unavoidable interruption of operation and degradation of effluent quality, shall be scheduled during noncritical water quality periods and carried out in a manner approved by the Director.

3. Transfer of Ownership of Control

a. This permit is not transferable to any person except after notice to the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Clean Water Act.

[40 CFR § 122.41(l)(3)]

b. In some cases modification or revocation and reissuance is mandatory.

[40 CFR § 122.61]

c. Automatic transfers. As an alternative to transfers of permits by modification, any NPDES permit may be automatically transferred to a new permittee if:

(1) The current permittee notifies the Director at least 30 days in advance of the proposed transfer date in Subparagraph b.(2) of this subsection;

(2) The notice includes a written agreement between the existing and new permittees containing a specific date for transfer of permit responsibility, coverage, and liability between them; and

(3) The Director does not notify the existing permittee and the proposed new permittee of his or her intent to modify or revoke and reissue the permit. A modification under this subparagraph may also be a minor modification under 40 CFR § 122.63. If this notice is not received, the transfer is effective on the date specified in the agreement mentioned in Subparagraph b.(2) of this subsection.

[40 CFR § 122.61(b)]

4. Monitoring Reports

Monitoring results shall be reported at the intervals specified in Part III of the permit.

[40 CFR § 122.41(l)(4)]

Monitoring results must be reported on a Discharge Monitoring Report (DMR) or forms provided or specified by the Director for reporting results of monitoring of sludge use or disposal practices.

[40 CFR § 122.41(l)(4)(i)]

5. Additional Monitoring by the Permittee

If the permittee monitors any pollutant more frequently than required by the permit using test procedures approved under 40 CFR part 136 or, in the case of sludge use or disposal, approved under 40 CFR part 136 unless otherwise specified in 40 CFR part 503, or as specified in the permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Director.

[40 CFR § 122.41(l)(4)(ii)]

6. Averaging of Measurements

Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.

[40 CFR § 122.41(l)(4)(iii)]

7. Compliance Schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date.

[40 CFR § 122.41(l)(5)]

Any reports of noncompliance shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirement.

8. Twenty-Four Hour Reporting

The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

The following shall be included as information which must be reported within 24 hours under this paragraph.

a. Any unanticipated bypass which exceeds any effluent limitation in the permit. [See 40 CFR § 122.44(g).]

b. Any upset which exceeds any effluent limitation in the permit.

c. Violation of a maximum daily discharge limitation for any of the pollutants listed by the Director in the permit to be reported within 24 hours. [See 40 CFR § 122.44(g)]

The Director may waive the written report on a case-by-case basis for reports under this subsection if the oral report has been received within 24 hours.

[40 CFR § 122.41(l)(6)]

9. Other Noncompliance

The permittee shall report all instances of noncompliance not reported under Section D at the time monitoring reports are submitted. The reports shall contain the information listed in Section D, Subsection 8.

[40 CFR § 122.41(l)(7)]

10. Other Information

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, it shall promptly submit such facts or information to the Director.

[40 CFR § 122.41(l)(8)]

11. Changes in Discharge of Toxic Substances

The following conditions apply to all NPDES permits within the categories specified below:

a. *Existing manufacturing, commercial, mining, and silvicultural dischargers.* All existing manufacturing, commercial, mining, and silvicultural dischargers must notify the Director as soon as they know or have reason to believe:

(1) That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

(a) One hundred micrograms per liter (100 μg/l);

(b) Two hundred micrograms per liter (200 μg/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 μg/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony; or

(c) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR § 122.21(g)(7).

[40 CFR § 122.42(a)(1)(i-iii)]

(2) That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

(a) Five hundred micrograms per liter (500 μg/l);

(b) One milligram per liter (1 mg/l) for antimony; or

(c) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR § 122.21(g)(7).

[40 CFR § 122.42(a)(2)(i-iii)]

b. *Publicly owned treatment works.* All POTWs must provide adequate notice to the Director of the following:

(1) Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to Section 301 or 306 of CWA if it were directly discharging those pollutants; and

(2) Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

(3) For purposes of this paragraph, adequate notice shall include information on

(a) the quality and quantity of effluent introduced into the POTW, and

(b) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

[40 CFR § 122.42(b)]

12. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit.

[40 CFR § 122.41(b)]

The application should be submitted at least 180 days before the expiration date of this permit. The Regional Administrator may grant permission to submit an application later than the 180 days in advance, but no later than the permit expiration date.

[40 CFR § 122.21(d)]

When EPA is the permit-issuing authority, the conditions of an expired permit continue in force under 5 U.S.C. 558(c) until the effective date of a new permit if the permittee has submitted a timely application under this subsection which is a complete application for a new permit; and the Regional Administrator, through no fault of the permittee, does not issue a new permit with an effective date on or before the expiration date of the previous permit.

[40 CFR § 122.6(a)]

Permits continued under this section remain fully effective and enforceable.

[40 CFR § 122.6(b)]

13. Signatory Requirements

All applications, reports, or information submitted to the Director shall be signed and certified.

[40 CFR § 122.41(k)(1)]

a. *Applications.* All permit applications shall be signed as follows:

(1) *For a corporation.* By a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

(a) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or

(b) the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

NOTE: EPA does not require specific assignments or delegations of authority to responsible corporate officers identified in this subparagraph. The Agency will presume that these responsible corporate officers have the requisite authority to sign permit applications unless the corporation has notified the Director to the contrary. Corporate procedures governing authority to sign permit applications may provide for assignment or delegation to applicable corporate positions under this subparagraph rather than to specific individuals.

(2) *For a partnership or sole proprietorship.* By a general partner or the proprietor, respectively; or

(3) *For a municipality, State, Federal, or other public agency.* By either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

(a) the chief executive officer of the agency, or

(b) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

b. All reports required by permits, and other information requested by the Director shall be signed by a person described in Paragraph a. of this section, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

(1) The authorization is made in writing by a person described in Paragraph a. of this section;

(2) The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company, (a duly authorized representative may thus be either a named individual or any individual occupying a named position.) and,

(3) The written authorization is submitted to the Director.

c. *Changes to authorization.* If an authorization under Paragraph b. of this section is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Paragraph b. of this section must be submitted to the Director prior to or together with any reports, information, or applications to be signed by an authorized representative.

d. *Certification.* Any person signing a document under Paragraph a. or b. of this section shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

[40 CFR § 122.22]

14. Availability of Reports

Except for data determined to be confidential under 40 CFR Part 2, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the offices of the Permit Issuing Authority. As required by the Act, permit applications, permits and effluent data shall not be considered confidential.

[40 CFR §§ 124.18 & 122]

15. Penalties for Falsification of Reports

The CWA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

[40 CFR § 122.41(k)(2)]

SECTION E. DEFINITIONS

1. Permit Issuing Authority

The Regional Administrator of EPA Region 4 or his/her designee is the **"Permit Issuing Authority,"** unless at some time in the future the State or Indian Tribe receives authority to administer the NPDES program and assumes jurisdiction over the permit; at which time, the Director of the State program receiving the authorization becomes the issuing authority.

The use of the term "**Director**" in this permit shall apply to the Regional Administrator of EPA, Region 4.

[40 CFR § 122.2]

2. Act

"**Act**" means the Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Public Law 92-500, as amended by Public Law 95-217, Public Law 95-576, Public Law 96-483, and Public Law 97-117, 33 U.S.C. 1251 et seq.

[40 CFR § 124.2]

3. Discharge Monitoring Report (DMR)

"**Discharge Monitoring Report**" means the EPA national form (Form 3320-1) including any subsequent additions, revisions, or modifications for the reporting of self-monitoring results by permittees. EPA will prepare and mail "pre-printed" DMR forms to permittees for completion. These "pre-printed" DMR forms will indicate the appropriate reporting requirements and limitations as found in Part I of the permit.

[40 CFR § 122.2]

4. Measurements

a. "**Daily discharge**" means the "discharge of a pollutant" measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling.

For pollutants with limitations expressed in units of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the day.

For pollutants with limitations expressed in other units of measurement (i.e., concentration), the "daily discharge" is calculated as the average measurement of the pollutant over the day.

b. The "**average annual discharge limitation**" means the highest allowable average of "daily discharges" over a period of twelve consecutive calendar months, calculated as the "arithmetic mean" of the monthly averages for the current calendar month and the eleven prior calendar months. The annual average is calculated each month.

This limitation is identified as "Annual Average" in Part I of the permit.

c. The "**average monthly discharge limitation**" other than for bacterial indicators, means the highest allowable average of "daily discharges" over a calendar month, calculated as the sum of all "daily discharges" measured during a calendar month divided by the number of "daily discharges" measured during that month.

For bacterial indicators, the "average monthly discharge limitation" is calculated using a "geometric mean."

This limitation is identified as "Monthly Average" or "Daily Average" in Part I of the permit.

d. The "**average weekly discharge limitation**" means the highest allowable average of "daily discharges" over a calendar week, calculated as the sum of all "daily discharges" measured during a calendar week divided by the number of "daily discharges" measured during that week.

This limitation is identified as "Weekly Average" in Part I of the permit.

e. The "**maximum daily discharge limitation**" means the highest allowable "daily discharge."

This limitation is identified as "Daily Maximum" in Part I of the permit.

[40 CFR § 122.2]

5. Types of Samples

a. Composite Sample: A "**composite sample**" is a combination of not less than eight influent or effluent portions (aliquots), of at least 100 ml, collected over the full time period specified in Part I of the permit. The composite sample must be flow proportioned by either a time interval between each aliquot, or by volume as it relates to effluent flow at the time of sampling, or by total flow since collection of the previous aliquot. Aliquots may be collected manually or automatically.

b. Grab Sample: A "**grab sample**" is a single influent or effluent portion which is not a composite sample. The sample(s) shall be collected at the period(s) most representative of the total discharge.

6. Calculation of Means

a. Arithmetic Mean: The "**arithmetic mean**" of any set of values is the sum of the individual values divided by the number of individual values.

b. Geometric Mean: The "**geometric mean**" of any set of values is the N^{th} root of the product of the individual values where N is equal to the number of individual values. The geometric mean is equivalent to the antilog of the arithmetic mean of the logarithms of the individual values. For purposes of calculating the geometric mean, values of zero (0) shall be considered to be one (1).

7. Hazardous Substance

A "**hazardous substance**" means any substance designated under 40 CFR Part 116 pursuant to Section 311 of the Clean Water Act.

[40 CFR § 122.2]

8. Toxic Pollutants

A "**toxic pollutant**" is any pollutant listed as toxic under Section 307(a)(1) of the Clean Water Act or, in the case of "sludge use or disposal practices," any pollutant identified in regulations implementing Section 405(d) of the Clean Water Act.

[40 CFR § 122.2]

PART III

Other Requirements

A. Reporting of Monitoring Results

Monitoring results obtained for each month shall be summarized for that month and reported on a DMR Form (EPA No. 3320-1), postmarked no later than the 28th day of the month following the completed month for submittal to EPA. (For example, data for January shall be submitted by February 28.) Signed copies of the DMRs and all other reports, including those required by Section D of Part II, Reporting Requirements, shall be submitted to the following addresses:

Environmental Protection Agency
Region 4
Eastern Enforcement Section
Water Programs Enforcement Branch
Water Management Division
Atlanta Federal Center
61 Forsyth St., SW
Atlanta, GA 30303-8960

South Carolina Department of Health and Environmental Control
Bureau of Water
2600 Bull Street
Columbia, SC 29201

If no discharge occurs during the reporting period, sampling requirements of this permit do not apply. The statement "No Discharge" shall be written on the DMR Form. If, during the term of this permit, the facility ceases discharge to surface waters, the Permit Issuing Authority shall be notified immediately upon cessation of discharge. This notification shall be in writing.

B. Reopener Clause

This permit shall be modified, or alternatively, revoked and reissued, to comply with any applicable effluent standard or limitation, or sludge disposal requirement issued or approved under Sections 301(b)(2)(C) and (D), 307(a)(2), and 405(d)(2)(D) of the Clean Water Act, as amended, if the effluent standard, limitation, or sludge disposal requirement so issued or approved:

a. Contains different conditions or is otherwise more stringent than any condition in the permit; or

b. Controls any pollutant or disposal method not addressed in the permit.

The permit as modified or reissued under this paragraph shall also contain any other requirements of the Act then applicable.

C. Macroinvertebrate Assessement

1. Upon completion of the 2.0 MGD expansion, the permittee shall perform a Macroinvertebrate Assessment downstream from the discharge location during July, August or September of the calendar year. A second assessment, if required, should be conducted during January, February or March of the calendar year, and any other required, as proposed in the assessment plan and reviewed by EPA.

2. The permittee shall submit a study plan for EPA review based on the following document:

EPA publication entitled, "Revision to Rapid Bioassessment Protocols for Use in Streams and Rivers: Periphyton, Benthic Macroinvertebrates, and Fish," by M.T. Barbour, J. Gerritsen, B.D. Snyder, and J.B. Stribling (EPA 841-B-99-002).

Results of a given instream assessment must be submitted to the EPA within 90 days of completion of the sampling.

D. Pretreatment Program Requirements

The Permittee's Pretreatment Program to regulate flow from non-domestic discharge sources (hereafter called "industrial users") which was approved on December 19, 2002, must be conducted in accordance with 40 CFR Part 403, and is an enforceable condition of this permit.

1. Program Requirements and Reporting

a. In addition to the discharge monitoring reports (DMR) required in Part III.A, the Permittee shall include copies of the following with the DMR submitted on or before the 28th of January, April, July and October:

i. Any Permits to Discharge issued to, or Contracts entered into, with industrial users during the previous quarter if they must be regulated.

ii .The names of any industrial users that are in violation of their permit, or the prohibitions described in Part III.D.2, with explanation of the action(s) being carried out to bring them into compliance.

iii. Schedules of compliance agreed to or imposed on an industrial user for the purpose of returning the industrial user to compliance.

iv. A report with the following items:

(1) A complete list of the Permittee's industrial users, including their names, contact persons, and addresses, with identification of those added or deleted during the previous quarter and a brief explanation of why each was added or deleted. For each listed industrial user, notations must be made describing the type of limits in its permit. Where federal categorical Pretreatment Standards were applied, provide the Code of Federal Regulations citation for the limits (e.g., 433.17). Where local limits were applied that were more stringent than the categorical Pretreatment Standards, provide notation of such. Where the industrial user permit incorporates local limits only, provide notation of such.

(2) A summary providing the following figures for both the reported quarter and cumulative for the calendar year: total number of industrial users; total number of industrial users which received discharge monitoring by the Permittee; total number of industrial users which received inspections by the Permittee; total number of industrial users in compliance; and the total number of industrial users in non-compliance. For the purposes of this summary, when determining the inspection and monitoring totals each industrial user will be counted only once.

(3) A summary of changes to the Permittee's Pretreatment Program that have not been previously reported.

b. The Permittee shall require all industrial users to comply with pretreatment provisions of the Clean Water Act (Public Law 95-217), as set forth in the General Pretreatment Regulations, 40 CFR Part 403, promulgated thereunder, and with the Permittee's State Approved Pretreatment Program (R.61-9.403).

2. Prohibited Discharges

The Permittee shall not allow discharge of pollutant(s) into its treatment works by any industrial user, if such pollutant(s) may either cause Pass Through or cause Interference with the operation or performance of its publicly owned treatment works (POTW), as defined in 40 CFR Part 403. Further, the Permittee shall not allow introduction of the following pollutants into its POTW:

a. Pollutant(s) which create a fire or explosion hazard in the POTW, including, but not limited to, waste streams with a closed cup flashpoint of less than 140 degrees Fahrenheit or 60 degrees Centigrade using the test methods specified in 40 CFR Part 261.21;

b. Pollutant(s) which will cause corrosive structural damage to the POTW, but in no case discharges with pH lower than 5.0, unless the works is specifically designed to accommodate such discharges;

c. Solid or viscous pollutant(s) in amounts which will cause obstruction to the flow in the POTW resulting in Interference;

d. Any pollutant, including oxygen demanding pollutants, (BOD, etc.), released in a discharge at a flow rate and/or pollutant concentration which will cause Interference with the POTW;

e. Heat in amounts which will inhibit biological activity in the POTW resulting in Interference, but in no case heat in such quantities that the temperature at the POTW exceeds 40 °C (104 °F) unless the Permitting Authority, upon request of the POTW, approves alternate temperature limits;

f. Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause Interference or Pass Through;

g. Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity that may cause acute worker health and safety problems; and

h. Any trucked or hauled pollutants, except at discharge points designated by the POTW.

In accordance with 40 CFR Part 403.5(c), the Permittee shall develop and enforce specific prohibitions or limits on pollutants or pollutant parameters necessary to implement the prohibitions above. Such prohibitions and limits developed by the Permittee shall be deemed enforceable Pretreatment Standards for the purposes of Section 307(d) of the Clean Water Act (Public Law 95-217).

3. Headworks and Local Limits Evaluations

a. Within 120 days following the facility expansion end-construction date, the Permittee shall perform the following and submit a report to both addresses identified in Part III.A of this permit as an update to the Pretreatment Program submitted to SCDHEC on December 19, 2002. The report shall include:

i. Re-calculation of the headworks analysis to incorporate any changes in stream limits, removal rates, POTW design capacity, 7Q10 flows, the character and volume of pollutant loading due to existing or new industrial users, and other considerations. This includes evaluation of the need for new or revised local limits as required in 40 CFR Part 403.5(c) and 40 CFR Part 122.44(j)(2)(ii). The headworks analysis must take into consideration the Water Classifications and Standards for the Permittee's receiving waters to the satisfaction of the permit-issuing authority.

ii. Re-evaluation of the industrial allocation of pollutants, and the limits page(s) for each industrial user.

iii. Completed questionnaires from each industrial user surveyed.

iv. A comprehensive list showing what industrial users discharge to this treatment facility and applicable industrial category for each, if any.

The permit-issuing authority may subsequently require the Permittee to provide additional testing, information, and/or calculations to support this report, and prior to approval of any proposed revisions to the approved Pretreatment Program.

b. Within 60 days after final approval by the permit-issuing authority, the Permittee shall implement the approved changes and/or revisions to the Pretreatment Program.

PART IV

Chronic Whole Effluent Toxicity Testing Program

As required by Part I of this permit, the permittee shall initiate the series of tests described below beginning in October 2006, to evaluate chronic whole effluent toxicity of the discharge from outfall 001. All test species, procedures, and quality assurance criteria used shall be in accordance with Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, EPA-821-R-02-013 (October 2002), or the most current edition. The control and dilution water will be moderately hard water as described in EPA-821-R-02-013, Section 7, or the most current edition. A standard reference toxicant quality assurance chronic toxicity test shall be conducted concurrently with each species used in the toxicity tests and the results submitted with the Discharge Monitoring Report (DMR) Form. Alternatively, if monthly QA/QC reference toxicant tests are conducted, these results must be submitted with the DMR. Any deviation from the bioassay procedures outlined or cited herein shall be submitted in writing to the EPA for review and approval prior to use.

1. a. The permittee shall conduct a daphnid, Ceriodaphnia dubia, Survival and Reproduction test and a fathead minnow, Pimephales promelas, Larval Survival and Growth test. All tests shall be conducted using a control (0% effluent) and the following dilution concentrations: 100%, 50%, 25%, 12.5%, and 6.25%. The measured endpoint will be the inhibition concentration causing 25% reduction in survival, reproduction, and/or growth (IC_{25}) of the test organisms. The IC_{25} shall be determined based on a 25% reduction as compared to the controls, and as derived from linear interpolation. The average reproduction and growth responses will be determined based on the number of Ceriodaphnia dubia or Pimephales promelas larvae used to initiate the test.

   b. For each set of tests conducted, a 24 hr. composite sample of final effluent shall be collected and used per the sampling schedule discussed in EPA-821-R-02-013, Section 8.3, or the most current edition.

   c. If control mortality exceeds 20% for either species in any test, the test(s) for that species (including the control) shall be repeated. A test will be considered valid only if control mortality does not exceed 20% for either species. If, in any separate test, 100% mortality occurs prior to the end of the test, and control mortality is less than 20% at that time, that test (including the control) shall be terminated with the conclusion that the sample demonstrates unacceptable chronic toxicity. Each test must meet the test acceptability criteria for each species as defined in EPA-821-R-02-013, Section 13.12 and Section 11.12, respectively, or the most current edition.

Additionally, all test results must be evaluated and reported for concentration-response relationship based on "Method Guidance and Recommendations for Whole Effluent Toxicity (WET) Testing (40 CFR Part 136)", EPA/821/B-00/004 (2000), or the most current edition. If the required concentration-response review fails to yield a valid relationship per EPA/821/B-00/004 (or the most current edition), that test shall be repeated. Any test initiated but terminated prior to completion must be reported with a complete explanation for the termination.

2. a. The toxicity tests specified above are referred to as "routine" tests. Monitoring shall be conducted once every six months.

b Results from "routine" or additional tests shall be reported according to EPA-821-R-02-013, Section 10, or the most current edition. All results shall also be recorded and submitted on the Discharge Monitoring Report (DMR) in the following manner: If the IC_{25} of a test species is less than or equal to 100% effluent, "≤ 100%"shall be entered on the DMR for that species. If the IC_{25} of a test species is greater than 100% effluent, ">100 %" shall be entered.

3. a. If an IC_{25} of less than or equal to 100% effluent is found in a "routine test", the permittee shall conduct two valid additional tests on each species indicating the violation and report each IC_{25} obtained.

b. The first valid additional test shall be conducted using a control (0% effluent) and a minimum of five dilutions: 100%, 50.0%, 25%, 12.5%, and 6.25%. The dilution series may be modified in the second valid test to more accurately identify the toxicity.

c. For each additional test, the sample collection requirements and the test acceptability criteria and concentration-response relationships specified in sections 1.b and c. above, respectively, must be met for it to be considered valid. The first additional test shall begin within one week of the end of the "routine test", and shall be conducted weekly thereafter until two additional valid tests are completed.

FINAL WATER QUALITY CERTIFICATION

EPA NPDES Permit: SC0025356
Town of Timmonsville WWTF

SC Department of Health and Environmental Control
Bureau of Water, 2600 Bull Street
Columbia, S. C. 29201

July 13, 2006

The Department, acting on an application for Water Quality Certification pursuant to Section 401 of the Federal Clean Water Act and applicable regulations, hereby provides certification of EPA's NPDES permit for the project described below pursuant to R.61-101.

Name: Timmonsville WWTF SC0025356
Project: Discharge of treated wastewater to Sparrow Swamp to Lynches River
County: Florence

The Bureau of Water has reviewed application and proposed permit for this project and determined that there is a reasonable assurance that the proposed project will be conducted in a manner consistent with the Certification requirements of Section 401 of the Federal Clean Water Act, as amended.

Both standard and facility-specific conditions of this certification are on the following pages.

Jeff deBessonet, Director
Water Facilities Permitting Division

D H E C
PROMOTE PROTECT PROVIDE
South Carolina Department of Health and Environmental Control

STANDARD CONDITIONS FOR ALL DOMESTIC NPDES PERMITS

- DEFINITIONS: In addition to the definitions in Part II Section E, the "Department" or "DHEC" shall refer to the South Carolina Department of Health and Environmental Control.

- INSPECTION AND ENTRY - In addition to Part II Section C.7, allow inspections and entry by DHEC staff. Also, replace Part II Section C.7.d as follows to include the SC Pollution Control Act:

  d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act and Pollution Control Act, any substances or parameters at any location.

- PROPER OPERATION AND MAINTENANCE - In addition to Part II Section B.1

  a. The permittee shall provide for the performance of daily treatment plant inspections by a certified operator of the appropriate grade. The inspection shall include, but is not limited to, areas which require a visual observation to determine efficient operations and for which immediate corrective measures can be taken using the O&M manual as a guide. All inspections shall be recorded and shall include the date, time and name of the person making the inspection, corrective measures taken, and routine equipment maintenance, repair, or replacement performed. The permittee shall maintain all records of inspections at the permitted facility as required by this permit. Records shall be made available for on-site review during normal working hours.

  b. The name and grade of the operator of record shall be submitted to DHEC/Bureau of Water/Water Enforcement Division prior to placing the facility into operation. A roster of operators associated with the facility's operation and their certification grades shall also be submitted with the name of the "operator-in-charge". Any changes in operator or operators shall be submitted to the Department as they occur.

- TWENTY-FOUR HOUR REPORTING – In addition to Part II Section D.8:

Any information shall [redacted]ed orally to local DHEC office within 24 hours from the time the permittee becomes aw[redacted]rcumstances. During normal working hours call:

County	EQC Region	Phone No.
Anderson, Oconee [redacted]	Region 1- Anderson EQC Office	864-260-5569
Abbeville, Edgefield[redacted]ood, Laurens, McCormic[redacted]	Region 1 – Greenwood EQC Office	864-223-0333
Greenville, Pickens [redacted]	Region 2 – Greenville EQC Office	864-241-1090
Cherokee, Spartanbu[redacted] Union	Region 2 – Spartanburg EQC Office	864-596-3800
Fairfield, Lexington, Newberry, Richland	Region 3 –Columbia EQC Office	803-896-0620
Chester, Lancaster, York	Region 3 – Lancaster EQC Office	803-285-7461
Chesterfield, Darlington, Dillon,	Region 4 – Florence EQC Office	843-661-4825

Florence, Marion, Marlboro		
Clarendon, Kershaw, Lee, Sumter	Region 4 – Sumter EQC Office	803-778-6548
Aiken, Allendale, Bamberg, Barnwell, Calhoun, Orangeburg	Region 5 – Aiken EQC Office	803-641-7670
Georgetown, Horry, Williamsburg	Region 6 – Myrtle Beach EQC Office	843-238-4378
Berkeley, Charleston, Dorchester	Region 7 – Charleston EQC Office	843-740-1590
Beaufort, Colleton, Hampton, Jasper	Region 8 – Beaufort EQC Office	843-846-1030

After-hour reporting should be made to the 24-Hour Emergency Response telephone number 803-253-6488 or 1-888-481-0125 outside of the Columbia area. A written submission shall also be provided to the Department within 5 days of the time the permittee becomes aware of the circumstances. This notification should be addressed to:

S.C. Department of Health and Environmental Control
Bureau of Water/Water Enforcement Division
Water Pollution Enforcement Section
2600 Bull Street
Columbia, South Carolina 29201

- ODOR CONTROL REQUIREMENTS – In addition to Part III of the permit:

The permittee shall use best management practices normally associated with the proper operation and maintenance of a sludge wastewater treatment site, any sludge storage or lagoon areas, transportation of sludges, and all other related activities to ensure that an undesirable level of odor does not exist.

a. The permittee shall prepare an odor abatement plan for the industrial sludge treatment sites, any sludge storage or lagoon areas, and land application or land disposal sites. The permittee shall prepare the plan in accordance with R.61-9.503.50 (Odor Control Requirements). Permittees that land apply sludge must complete the plan by June 26, 2004. For permittees with other sludge related activities, the plan must be completed by December 26, 2004. The plan must include the following:
   (1) Operation and maintenance practices which are used to eliminate or minimize undesirable odor levels in the form of best management practices for odor control;
   (2) Use of treatment processes for reduction of undesirable odors;
   (3) Use of setbacks;
   (4) Contingency plans and methods to address odor problems for the different type of disposal/application methods used.

b. The Department may review the odor abatement plan for compliance with R.61-9.503.50. The Department may require changes to the plan as appropriate.

c. The permittee shall not cause, allow, or permit emission into the ambient air of any substance or combinations of substances in quantities that an undesirable level of odor is determined to result unless preventative measures of the type set out below are taken to abate or control the emission

to the satisfaction of the Department. Should an odor problem come to the attention of the Department through field surveillance or specific complaints, the Department may determine, in accordance with section 48-1-120 of the Pollution Control Act, if the odor is at an undesirable level by considering the character and degree of injury or interference to:

(1) The health or welfare of the people;
(2) Plant, animal, freshwater aquatic, or marine life;
(3) Property; or
(4) Enjoyment of life or use of affected property.

d. Should the Department determine that an undesirable level of odor exists, the Department may require:

(1) The permittee to submit a corrective action plan to address the odor problem,
(2) Remediation of the undesirable level of odor within a reasonable timeframe, and
(3) In an order, specific methods to address the problem.

e. If the permittee fails to control or abate the odor problems addressed in this section within the specified timeframe, the Department may revoke disposal/application activities associated with the site or the specific aspect of the sludge management program.

f. The odor abatement plan shall be updated and maintained as necessary throughout the life of the permit.

- SLUDGE DISPOSAL REQUIREMENTS – In addition to Part III of the permit:

See the specific permit pages listed below for the permit conditions.

- SCHEDULE OF COMPLIANCE – As it relates to Part I.B of the permit:

If the permittee opts to construct wastewater treatment facilities or modification to existing facilities to meet the schedule of compliance in the permit, a construction permit and operational approval from the Department may be needed before the facilities are built and placed into operation. SC Regulation 61-67 governs the construction of wastewater treatment facilities. If a permit is needed, application for a construction permit must be made in a timely manner to assure that the Department has adequate review time prior to the implementation of any final permit limits that the construction relates to.

CONDITIONS SPECIFIC TO TOWN OF TIMMONSVILLE WWTP
NPDES PERMIT SC0020940

Flow Limits to be added to discharge Monitoring Pages.
1.29 MGD Design Flow
Monthly Average 1.29 MGD, Weekly Average 1.29 MGD

2.0 MGD Design Flow
Monthly Average 2.0 MGD, Weekly Average 2.0 MGD

Sludge Disposal Requirements

a. The permittee shall comply with effluent standards and/or prohibitions established under R.61-9.503 State Domestic Sludge Regulations, within the time provided in the regulations that establish these prohibitions or standards for sludge use or disposal, even if the NPDES permit has not yet been modified to incorporate the requirement.

b. The Permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit, which has a reasonable likelihood of adversely affecting human health or the environment.

c. This permit may be modified to address any standard for sludge use or disposal promulgated under R.61-9.503 State Domestic Sludge Regulations or additional controls of a pollutant or practice not currently limited in this permit.

d. Any sludge disposal permits issued by the Department will remain in effect and all conditions and requirements will apply; however, this does not relieve the permittee from complying with the conditions of State Regulation 61-9.503.

1. Compliance with the standards (R.61-9.503) shall be achieved as expeditiously as practicable, but in no case later than February 19,1994.

2. When compliance with the standard requires construction of new pollution control facilities, compliance with the standards (R.61-9.503) shall be achieved as expeditiously as possible but in no case later than February 19, 1995.

3. All other requirements for the frequency of monitoring, record keeping, and reporting identified in R.61-9.503, are effective on July 20, 1993.

e. The permittee must obtain prior Departmental approval of planned changes in the facility when the alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use of disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

f. The sludge disposal permit may be modified or revoked and reissued if there are material and substantial alterations or additions to the permitted facility or activity (including a change or

changes in the permittee's sludge use or disposal practice) which occurred after the permit issuance which justify the application of permit conditions which are different from or absent in the existing permit.

g. The sludge disposal permit may be terminated if there is a change in any condition that requires either a temporary or permanent reduction or elimination of any discharge or sludge use or disposal practice controlled by the permit.

h. Periodic inspections will be conducted by Department authorized representatives to ensure compliance with State regulations and permit stipulations. Any necessary modification to this permit may be based upon these evaluations.

i. Records of monitoring required by the permits related to sludge use and disposal activities must be kept at least five (5) years (or longer as required by R.61-9.503).

j. Sludge monitoring procedures shall be those specified in 1) R.61-9.503; 2) 40 CFR Part 503; 3) 40 CFR Part 136; or 4) other procedures specified in the sludge permit (in that order of "preference" depending on the availability and applicability of a particular method at the time the sludge permit is issued).

k. The permittee must provide sludge monitoring results on a form(s) approved by the Department.

l. The permittee shall submit the results of all sludge monitoring if done more frequently than required by the sludge permit. The permittee may be required to maintain specific records at the facility and on request may also be required to furnish them to the Department.

m. The permittee should note that under 40 CFR 122.44(l), the "anti-backsliding" provision applies only to surface water dischargers. The "anti-backsliding" provision does not apply to sludge use and disposal activities.

Reporting requirements

Monitoring reports

Copies of the Monitoring results for items below must be reported forms provided or specified by the Department for reporting results of monitoring of groundwater monitoring, sludge use or disposal practices including the following:

Sludge, Biosolids and/or Soil Monitoring:

Copies of Sludge, biosolids and/or soil monitoring results obtained at the required frequency shall be reported in a laboratory format postmarked no later than the 28th day of the month following the end of the monitoring period. Two copies of these results shall be submitted to:

S.C. Department of Health and Environmental Control
Bureau of Water/Water Enforcement Division
Water Pollution Enforcement Section
2600 Bull Street
Columbia, South Carolina 29201

Copies of the pretreatment program reports shall be submitted (with the discharge monitoring reports) on or before the 28th of January to:

S.C. Department of Health and Environmental Control
Bureau of Water/Water Enforcement Division
Water Pollution Enforcement Section
2600 Bull Street
Columbia, South Carolina 29201

Schedule of Compliance:

The permittee shall achieve compliance with the Pretreatment Program in accordance with the following schedule:

a. Within 120 days following the approval to place in operation the facility expansion to 2.0 MGD, the permittee shall submit the following to the Department as an update to the pretreatment program previously submitted and dated December 19, 2002:

(1) The headworks analysis shall be recalculated to incorporate any changes in stream limits, removal rates, POTW design capacity, 7Q10 flows, etc. This includes evaluation of the need for local limits as defined under R.61-9 403.5(c) and (d). The headworks analysis must take into consideration the Water Classifications and Standards for the permittee's receiving stream to the satisfaction of the Department.

(2) Reevaluation of industrial allocation of pollutants.

(3) Submittal for approval of draft revised Industrial User Permits.

b. Within 60 days after final approval by the Department, the permittee shall implement the approved changes and/or revisions to the pretreatment program.

4. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each scheduled date.

Pretreatment Regulations and Program Requirements

1.a. The permittee's will develop a Pretreatment Program as specified in the Schedule of Compliance in Part IV. of this permit. The Permittee shall begin implementation of the pretreatment program update within 60 days of the approval.

b. In addition to the discharge monitoring reports submitted in accordance with Part II.L.4., the Permittee shall also submit copies of the following with the discharge monitoring reports on or before the 28th of January, April, July, and October.

- Any Permits to Discharge issued to, or Contracts entered into with, non-domestic dischargers during the previous quarter if said dischargers must be regulated.

- The names of any non-domestic dischargers that are in violation of any limits, either specific or general, imposed as part of the Pretreatment Program and an explanation of the action(s) being carried out to bring them into compliance.

- Any schedules of compliance agreed to by or imposed on a non-domestic discharger for the purpose of bringing said discharger into compliance with the established discharge limits.

- A report showing the number of regulated non-domestic dischargers; the number monitored and/or inspected during the quarter; the cumulative number monitored and/or inspected during the year to date; the number in compliance and non-compliance during the quarter and the number in compliance or non-compliance during the year to date.

c. Permittee shall require all non-domestic dischargers into Permittee's system to comply with pretreatment provisions of the Clean Water Act (Public Law 95-217), as set forth in the General Pretreatment Regulations, 40 CFR Part 403, promulgated thereunder, and with the Permittee's State Approved Pretreatment Program (R.61-9.403).

2. Prohibited Discharges

The Permittee shall not allow discharge of pollutant(s) into its treatment works by any non-domestic source(s), if such pollutant(s) may inhibit or interfere with the operation or performance of the works. Further, the Permittee shall not allow introduction of the following pollutants into its treatment works:

a. Pollutant(s) which create a fire or explosion hazard in the POTW, including, but not limited to, wastestreams with a closed cup flashpoint of less than 140 degrees Fahrenheit or 60 degrees Centigrade using the test methods specified in 40 CFR 261.21.

b. Pollutant(s) which will cause corrosive structural damage to the POTW, but in no case discharges with pH lower than 5.0, unless the works is specifically designed to accommodate such discharges.

c. Solid or viscous pollutant(s) in amounts which will cause obstruction to the flow in the POTW resulting in interference.

d. Any pollutant, including oxygen demanding pollutants, (BOD, etc.), released in a discharge at a flow rate and/or pollutant concentration which will cause interference with the POTW.

e. Heat in amounts which will inhibit biological activity in the POTW resulting in interference, but in no case heat in such quantities that the temperature at the POTW Treatment Plant exceeds 40oC.(104°F) unless the Approval Authority, upon request of the POTW, approves alternate temperature limits.

f. Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through.

g. Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity that may cause acute worker health and safety problems.

h. Any trucked or hauled pollutants, except at discharge points designated by the POTW.

Appendix B

Hydraulic Analysis Technical Documentation

CDM Smith	CLIENT	City of Florence, SC	JOB NO	8385-95572	DATE 10/16/13
	PROJECT	Timmonsville POTW Consent Decree	DATE CHECKED	10/29/13	COMPUTED BY DAR
	DETAIL	Cover Sheet - Hydraulic Calculations	CHECKED BY	CSF	

Process Performance-System Analysis Calculations for City of Florence, SC Timmonsville POTW

Process Description: Conduct a hydraulic analysis of the Timmonsville WWTP per the requirements stated in the CD.

1.0 Contents

1.1 Purpose/Objective: Perform a hydraulic model at high and low head conditions to evaluate the capacity of the Influent Pump Station using Bentley WaterGEMS®.
Perform a hydraulic profile model using Visual Hydraulics® to evaluate the hydraulic capacity of the Timmonsville WWTP.

1.2 Procedure/Approach: Procedure and Approach as outlined in Section 3 of the CPE.

1.3 Data and References:

1984, Improving POTW Performance Using the Composite Correction Program Approach Handbook, United Stated Environmental Protection Agency
2008, Wastewater System Improvements Record Drawings, Town of Timmonsville, SC, B.P. Barber & Associates, Inc
2012, Water Compliance Inspection Report, Town of Timmonsville, SC, United States Environmental Protection Agency.
2013, Timmonsville Wastewater Treatment Plant Filter Inspection, Town of Timmonsville, SC, CDM Smith Inc
2013, Preliminary Engineering Report, Town of Timmonsville, SC, CDM Smith Inc

1.4 Assumptions and Limitations: Assumptions and Limitations as outlined in Section 3 of the CPE.

1.5 Legend: The following text and cell color codes are used in this spreadsheet and indicate the following

	blue shaded cell = value that requires manual input
text	black text = notes, equations, and results that do not need updating for typical calculations
<<--text	green text with arrow = notes, assumptions, or references to data sources

PERFORMANCE CURVE

VOLUTE 38222-701 CURVE T10A-B-4

IMPELLER 38615-014 MODEL T10A-B

SIZE 10"X10" IMP.DIA. 14.75"

SP.GR. 1.0 RPM NOTED

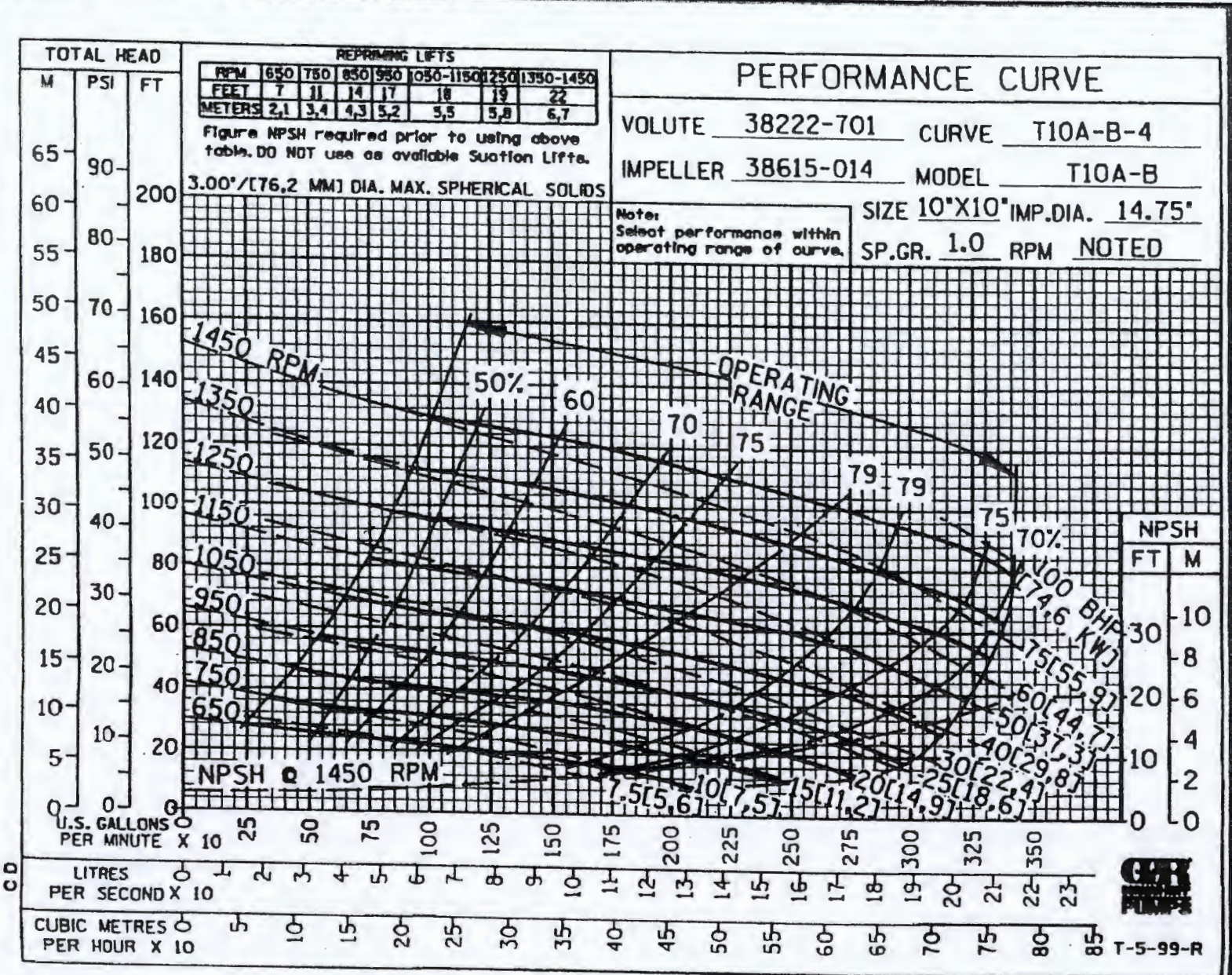
REPRIMING LIFTS

RPM	650	750	850	950	1050-1150	1250	1350-1450
FEET	7	11	14	17	18	19	22
METERS	2,1	3,4	4,3	5,2	5,5	5,8	6,7

Figure NPSH required prior to using above table. DO NOT use as available Suction Lifts.

3.00"/[76,2 MM] DIA. MAX. SPHERICAL SOLIDS

Note: Select performance within operating range of curve.



THE GORMAN-RUPP COMPANY • MANSFIELD, OHIO

GORMAN-RUPP OF CANADA LIMITED • ST. THOMAS, ONTARIO, CANADA

Specifications Subject to Change Without Notice

Printed in U.S.A.

Timmonsville WWTP Headworks 5 MGD.vhf

Hydraulic Profile Summary

Current flow conditions

Forward Flow	Return I Flow	Return II Flow	Return III Flow
5 mgd	-----	-----	-----

Section Description	Water Surface Elevation
Starting water surface elevation	**112.3**
18-inch (From Headworks Channel to Pump Station)	**112.84**
Pipe shape = Circular	
Diameter = 18 in	
Length = 20 ft	
Flow = 5 mgd	
Friction method = Manning's Equation	
Friction factor = 0.012	
Total fitting K value = 1.5	
Pipe area = 1.767 ft²	
Pipe hydraulic radius = 0.375	
Age factor = 1	
Solids factor = 1	
Velocity = 4.38 ft/s	
Units on-line = 1	
Total flow, all units = 5 mgd	
Friction loss = 0.09 ft	
Fitting loss = 0.45 ft	
Total loss = 0.54 ft	
Headworks Outlet Weir	**113.61**
Weir invert (top of weir) = 113	
Weir length = 5 ft	
Weir height = 5.65 ft	
Weir 'C' coefficient = 3.268	
Flow over weir = 5 mgd	
Weir submergence = unsubmerged	
Units on-line = 1	
Total flow, all units = 5 mgd	
Head over weir = 0.61 ft	
Headworks Channel 1	**113.61**
Channel shape = Rectangular	
Manning's 'n' = 0.012	
Channel length = 20 ft	
Channel width/diameter = 5 ft	

Section Description	Water Surface Elevation
Flow = 5 mgd	
Downstream channel invert = 107.35	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 31.29 ft²	
Flow profile = Horizontal	
Normal depth = Infinite	
Critical depth = 0.421 ft	
Units on-line = 1	
Total flow, all units = 5 mgd	
Depth downstream = 6.26 ft	
Bend loss = 0 ft	
Depth upstream = 6.26 ft	
Velocity = 0.25 ft/s	
Headworks Intermediate Weir	**115.61**
Weir invert (top of weir) = 115	
Weir length = 5 ft	
Weir height = 7.65 ft	
Weir 'C' coefficient = 3.255085	
Flow over weir = 5 mgd	
Weir submergence = unsubmerged	
Units on-line = 1	
Total flow, all units = 5 mgd	
Head over weir = 0.61 ft	
Mech Bar Screen	**117.61**
Change in elevation = 2 ft	
Headworks Channel Inlet	**117.61**
Channel shape = Rectangular	
Manning's 'n' = 0.012	
Channel length = 30 ft	
Channel width/diameter = 5 ft	
Flow = 5 mgd	
Downstream channel invert = 113	
Channel slope = 0 ft/ft	
Channel side slope = not applicable	
Area of flow = 23.05 ft²	
Flow profile = Horizontal	
Normal depth = Infinite	
Critical depth = 0.421 ft	
Depth downstream = 4.61 ft	
Units on-line = 1	
Total flow, all units = 5 mgd	
Bend loss = 0 ft	
Depth upstream = 4.61 ft	
Downstream velocity = 0.34 ft/s	

Timmonsville WWTP 5 MGD.vhf

Hydraulic Profile Summary

Current flow conditions

Forward Flow	Return I Flow	Return II Flow	Return III Flow
5 mgd	-----	-----	-----

Section Description	Water Surface Elevation
Starting water surface elevation	**122.2**
30-inch RCP (Swamp to Manhole 1)	**122.3**
Pipe shape = Circular	
Diameter = 30 in	
Length = 124 ft	
Flow = 5 mgd	
Friction method = Manning's Equation	
Friction factor = 0.012	
Total fitting K value = 1.5	
Pipe area = 4.909 ft²	
Pipe hydraulic radius = 0.625	
Age factor = 1	
Solids factor = 1	
Velocity = 1.58 ft/s	
Units on-line = 1	
Total flow, all units = 5 mgd	
Friction loss = 0.04 ft	
Fitting loss = 0.06 ft	
Total loss = 0.1 ft	
Manhole 1	**122.31**
Manhole config. = one pipe in, one pipe out	
Angle between pipes = 180 degrees	
Diameter of pipe into manhole = 30 in	
Diameter of pipe out of manhole = 30 in	
Flow through manhole = 5 mgd	
Velocity of pipe into manhole = 1.58 ft/s	
Manhole configuration K value = 0.3	
Units on-line = 1	
Total flow, all units = 5 mgd	
Overall head loss = 0.01 ft	
30-inch RCP (Manhole 1 to Manhole 2)	**122.41**
Pipe shape = Circular	
Diameter = 30 in	
Length = 124 ft	

Section Description	Water Surface Elevation
Flow = 5 mgd Friction method = Manning's Equation Friction factor = 0.012 Total fitting K value = 1.5 Pipe area = 4.909 ft² Pipe hydraulic radius = 0.625 Age factor = 1 Solids factor = 1 Velocity = 1.58 ft/s Units on-line = 1 Total flow, all units = 5 mgd Friction loss = 0.04 ft Fitting loss = 0.06 ft Total loss = 0.1 ft	
Manhole 2	**122.42**
Manhole config. = one pipe in, one pipe out Angle between pipes = 180 degrees Diameter of pipe into manhole = 30 in Diameter of pipe out of manhole = 30 in Flow through manhole = 5 mgd Velocity of pipe into manhole = 1.58 ft/s Manhole configuration K value = 0.3 Units on-line = 1 Total flow, all units = 5 mgd Overall head loss = 0.01 ft	
30-inch RCP (Manhole 2 to Manhole 3)	**122.48**
Pipe shape = Circular Diameter = 30 in Length = 73 ft Flow = 5 mgd Friction method = Manning's Equation Friction factor = 0.012 Total fitting K value = 1 Pipe area = 4.909 ft² Pipe hydraulic radius = 0.625 Age factor = 1 Solids factor = 1 Velocity = 1.58 ft/s Units on-line = 1 Total flow, all units = 5 mgd Friction loss = 0.02 ft Fitting loss = 0.04 ft Total loss = 0.06 ft	
30-inch RCP (Manhole 2 to Manhole 3 Gravity)	**122.02**
Channel shape = Circular	

Section Description	Water Surface Elevation
Manning's 'n' = 0.012 Channel length = 50 ft Channel width/diameter = 2.5 ft Flow = 5 mgd Downstream channel invert = 120.5 Channel slope = 0.02 ft/ft Channel side slope = not applicable Area of flow = 2.45 ft² Flow profile = Steep Normal depth = 0.6 ft Critical depth = 1.01 ft Units on-line = 1 Total flow, all units = 5 mgd Depth downstream = 1.98 ft Bend loss = 0 ft Depth upstream = 0.52 ft Velocity = 1.86 ft/s	
Manhole 3	**122.03**
Manhole config. = one pipe in, one pipe out Angle between pipes = 180 degrees Diameter of pipe into manhole = 30 in Diameter of pipe out of manhole = 30 in Flow through manhole = 5 mgd Velocity of pipe into manhole = 1.58 ft/s Manhole configuration K value = 0.3 Units on-line = 1 Total flow, all units = 5 mgd Overall head loss = 0.01 ft	
30-inch RCP (Manhole 3 to Effluent Flume)	**122.21**
Channel shape = Circular Manning's 'n' = 0.012 Channel length = 50 ft Channel width/diameter = 2.5 ft Flow = 5 mgd Downstream channel invert = 121 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 2.12 ft² Flow profile = Horizontal Normal depth = Infinite Critical depth = 1.01 ft Units on-line = 1 Total flow, all units = 5 mgd Depth downstream = 1.03 ft Bend loss = 0 ft Depth upstream = 1.21 ft	

Section Description	Water Surface Elevation
Velocity = 4.06 ft/s	
Effluent Flume	**124.54**
Flume invert = 123.36	
Flume throat width = 1.5 ft	
Flow through flume = 5 mgd	
Flume 'm' value = 6	
Flume 'e' value = 1.538	
Units on-line = 1	
Total flow, all units = 5 mgd	
Head through flume = 1.18 ft	
30-inch RCP (From Effluent Flume to Manhole 4)	**124.61**
Pipe shape = Circular	
Diameter = 30 in	
Length = 50 ft	
Flow = 5 mgd	
Friction method = Manning's Equation	
Friction factor = 0.012	
Total fitting K value = 1.5	
Pipe area = 4.909 ft²	
Pipe hydraulic radius = 0.625	
Age factor = 1	
Solids factor = 1	
Velocity = 1.58 ft/s	
Units on-line = 1	
Total flow, all units = 5 mgd	
Friction loss = 0.02 ft	
Fitting loss = 0.06 ft	
Total loss = 0.07 ft	
Manhole 4	**124.73**
Manhole config. = one pipe in, one pipe out	
Angle between pipes = 120 degrees	
Diameter of pipe into manhole = 20 in	
Diameter of pipe out of manhole = 30 in	
Flow through manhole = 5 mgd	
Velocity of pipe into manhole = 3.55 ft/s	
Manhole configuration K value = 0.6	
Units on-line = 1	
Total flow, all units = 5 mgd	
Overall head loss = 0.12 ft	
20-inch RCP (Manhole 4 to CCC)	**125.27**
Pipe shape = Circular	
Diameter = 20 in	
Length = 95 ft	
Flow = 5 mgd	

Section Description	Water Surface Elevation
Friction method = Manning's Equation Friction factor = 0.012 Total fitting K value = 1.5 Pipe area = 2.182 ft² Pipe hydraulic radius = 0.417 Age factor = 1 Solids factor = 1 Velocity = 3.55 ft/s Units on-line = 1 Total flow, all units = 5 mgd Friction loss = 0.25 ft Fitting loss = 0.29 ft Total loss = 0.54 ft	
Effluent Box	**125.27**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 4 ft Channel width/diameter = 4 ft Flow = 5 mgd Downstream channel invert = 123 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 9.08 ft² Flow profile = Horizontal Normal depth = Infinite Critical depth = 0.488 ft Units on-line = 1 Total flow, all units = 5 mgd Depth downstream = 2.27 ft Bend loss = 0 ft Depth upstream = 2.27 ft Velocity = 0.85 ft/s	
Effluent Exit Wall	**129.87**
Weir invert (top of weir) = 129.17 Weir length = 4 ft Weir height = 6 ft Weir 'C' coefficient = 3.272 Flow over weir = 5 mgd Weir submergence = unsubmerged Units on-line = 1 Total flow, all units = 5 mgd Head over weir = 0.7 ft	
CCC Effluent Channel	**129.88**
Channel shape = Rectangular Manning's 'n' = 0.012	

Section Description	Water Surface Elevation
Channel length = 28 ft Channel width/diameter = 4 ft Flow = 5 mgd Downstream channel invert = 123.17 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 26.82 ft² Flow profile = Horizontal Normal depth = Infinite Critical depth = 0.488 ft Units on-line = 1 Total flow, all units = 5 mgd Depth downstream = 6.7 ft Bend loss = 0 ft Depth upstream = 6.71 ft Velocity = 0.29 ft/s	
CCT Effluent Weir	**130.85**
Weir invert (top of weir) = 130.15 Weir length = 4 ft Weir height = 6 ft Weir 'C' coefficient = 3.272 Flow over weir = 5 mgd Weir submergence = unsubmerged Units on-line = 1 Total flow, all units = 5 mgd Head over weir = 0.7 ft	
CCC Channels	**130.86**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 156 ft Channel width/diameter = 4 ft Flow = 5 mgd Downstream channel invert = 124.17 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 26.74 ft² Flow profile = Horizontal Normal depth = Infinite Critical depth = 0.488 ft Units on-line = 1 Total flow, all units = 5 mgd Depth downstream = 6.68 ft Bend loss = 0 ft Depth upstream = 6.69 ft Velocity = 0.29 ft/s	

Section Description	Water Surface Elevation
Stop Gate Wall Weir invert (top of weir) = 129.17 Weir length = 2 ft Weir height = 5 ft Weir 'C' coefficient = 3.318 Flow over weir = 5 mgd Weir submergence = fully submerged Units on-line = 1 Total flow, all units = 5 mgd Head over weir = 1.11 ft	**131.04**
CCC Influent Channel Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 15 ft Channel width/diameter = 4 ft Flow = 5 mgd Downstream channel invert = 124.17 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 27.47 ft^2 Flow profile = Horizontal Normal depth = Infinite Critical depth = 0.488 ft Units on-line = 1 Total flow, all units = 5 mgd Depth downstream = 6.87 ft Bend loss = 0 ft Depth upstream = 6.87 ft Velocity = 0.28 ft/s	**131.04**
Influent Baffle Wall Weir invert (top of weir) = 127.17 Weir length = 5 ft Weir height = 3 ft Weir 'C' coefficient = 3.309 Flow over weir = 5 mgd Weir submergence = fully submerged Units on-line = 1 Total flow, all units = 5 mgd Head over weir = 0.6 ft	**131.06**
CCC Influent Box Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 15 ft Channel width/diameter = 3 ft Flow = 5 mgd	**131.06**

Section Description	Water Surface Elevation
Downstream channel invert = 124.17 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 20.67 ft² Flow profile = Horizontal Normal depth = Infinite Critical depth = 0.591 ft Units on-line = 1 Total flow, all units = 5 mgd Depth downstream = 6.89 ft Bend loss = 0 ft Depth upstream = 6.89 ft Velocity = 0.37 ft/s	
20-inch FLT (CCC to Filters) Pipe shape = Circular Diameter = 20 in Length = 960 ft Flow = 5 mgd Friction method = Manning's Equation Friction factor = 0.012 Total fitting K value = 3.05 Pipe area = 2.182 ft² Pipe hydraulic radius = 0.417 Age factor = 1 Solids factor = 1 Velocity = 3.55 ft/s Units on-line = 1 Total flow, all units = 5 mgd Friction loss = 2.52 ft Fitting loss = 0.6 ft Total loss = 3.11 ft	134.18
20-inch Underdrain (Filter No.3) Pipe shape = Circular Diameter = 20 in Length = 100 ft Flow = 3.75 mgd Friction method = Manning's Equation Friction factor = 0.012 Total fitting K value = 2.5 Pipe area = 2.182 ft² Pipe hydraulic radius = 0.417 Age factor = 1 Solids factor = 1 Velocity = 2.66 ft/s Units on-line = 1 Total flow, all units = 3.7 mgd	134.6

Section Description	Water Surface Elevation
Friction loss = 0.15 ft Fitting loss = 0.27 ft Total loss = 0.42 ft	
20-inch Underdrain (Filter No.2) Pipe shape = Circular Diameter = 20 in Length = 100 ft Flow = 2.5 mgd Friction method = Manning's Equation Friction factor = 0.012 Total fitting K value = 2.69 Pipe area = 2.182 ft² Pipe hydraulic radius = 0.417 Age factor = 1 Solids factor = 1 Velocity = 1.77 ft/s Units on-line = 1 Total flow, all units = 2.5 mgd Friction loss = 0.07 ft Fitting loss = 0.13 ft Total loss = 0.2 ft	**134.8**
18-inch Underdrain Pipe shape = Circular Diameter = 18 in Length = 90 ft Flow = 1.25 mgd Friction method = Manning's Equation Friction factor = 0.012 Total fitting K value = 2.75 Pipe area = 1.767 ft² Pipe hydraulic radius = 0.375 Age factor = 1 Solids factor = 1 Velocity = 1.09 ft/s Units on-line = 1 Total flow, all units = 1.3 mgd Friction loss = 0.03 ft Fitting loss = 0.05 ft Total loss = 0.08 ft	**134.88**
6-inch Underdrain Pipe shape = Circular Diameter = 6 in Length = 200 ft Flow = 0.1 mgd Friction method = Manning's Equation	**135.01**

Section Description	Water Surface Elevation
Friction factor = 0.012 Total fitting K value = 0 Pipe area = 0.196 ft² Pipe hydraulic radius = 0.125 Age factor = 1 Solids factor = 1 Velocity = 0.79 ft/s Units on-line = 1 Total flow, all units = 0.1 mgd Friction loss = 0.13 ft Fitting loss = 0 ft Total loss = 0.13 ft	
Perforated Pipe Loss (assumed 1 hole every 6-inches) Opening type = circular orifice Opening diameter/width = 1 in Opening height = not applicable Invert = 137.07 Number of openings = 100 Flow through opening(s) = 1.25 mgd Total area of opening(s) = 0.55 ft² Velocity through opening(s) = 3.55 ft/s Flow behavior = orifice, no downstream control Units on-line = 1 Total flow, all units = 1.3 mgd Orifice loss = 0.54 ft Downstream water level = 135.01 Upstream water level = 137.61	**137.61**
Sand Filter Loss (Assumed per Exist Hyd Prof) Change in elevation = 3.5 ft	**141.11**
Mud Valve Riser (Filter No. 5) Pipe shape = Circular Diameter = 6 in Length = 4 ft Flow = 0.63 mgd Friction method = Manning's Equation Friction factor = 0.012 Total fitting K value = 2.99 Pipe area = 0.196 ft² Pipe hydraulic radius = 0.125 Age factor = 1 Solids factor = 1 Velocity = 4.92 ft/s Units on-line = 1 Total flow, all units = 0.6 mgd Friction loss = 0.1 ft	**142.34**

Section Description	Water Surface Elevation
Fitting loss = 1.13 ft Total loss = 1.23 ft	
8-inch Filter Feed (To Filter No. 5) Pipe shape = Circular Diameter = 8 in Length = 145 ft Flow = 0.63 mgd Friction method = Manning's Equation Friction factor = 0.012 Total fitting K value = 0.19 Pipe area = 0.349 ft² Pipe hydraulic radius = 0.167 Age factor = 1 Solids factor = 1 Velocity = 2.77 ft/s Units on-line = 1 Total flow, all units = 0.6 mgd Friction loss = 0.79 ft Fitting loss = 0.02 ft Total loss = 0.81 ft	**143.15**
12-inch Filter Feed (To Filter No. 5) Pipe shape = Circular Diameter = 12 in Length = 145 ft Flow = 0.63 mgd Friction method = Manning's Equation Friction factor = 0.012 Total fitting K value = 1.92 Pipe area = 0.785 ft² Pipe hydraulic radius = 0.25 Age factor = 1 Solids factor = 1 Velocity = 1.23 ft/s Units on-line = 1 Total flow, all units = 0.6 mgd Friction loss = 0.09 ft Fitting loss = 0.05 ft Total loss = 0.14 ft	**143.29**
16-inch Filter Feed (To Filter No. 5) Pipe shape = Circular Diameter = 16 in Length = 95 ft Flow = 0.63 mgd Friction method = Manning's Equation Friction factor = 0.012	**143.32**

Section Description	Water Surface Elevation
Total fitting K value = 2.05 Pipe area = 1.396 ft² Pipe hydraulic radius = 0.333 Age factor = 1 Solids factor = 1 Velocity = 0.69 ft/s Units on-line = 1 Total flow, all units = 0.6 mgd Friction loss = 0.01 ft Fitting loss = 0.02 ft Total loss = 0.03 ft	
16-inch Filter Feed (Manifold at Filter No. 5) Pipe shape = Circular Diameter = 16 in Length = 12 ft Flow = 1.25 mgd Friction method = Manning's Equation Friction factor = 0.012 Total fitting K value = 2.99 Pipe area = 1.396 ft² Pipe hydraulic radius = 0.333 Age factor = 1 Solids factor = 1 Velocity = 1.38 ft/s Units on-line = 1 Total flow, all units = 1.3 mgd Friction loss = 0.01 ft Fitting loss = 0.09 ft Total loss = 0.1 ft	**143.42**
24-inch Filter Feed (To Filter No. 5) Pipe shape = Circular Diameter = 24 in Length = 102 ft Flow = 1.25 mgd Friction method = Manning's Equation Friction factor = 0.012 Total fitting K value = 0 Pipe area = 3.142 ft² Pipe hydraulic radius = 0.5 Age factor = 1 Solids factor = 1 Velocity = 0.62 ft/s Units on-line = 1 Total flow, all units = 1.3 mgd Friction loss = 0.01 ft Fitting loss = 0 ft	**143.43**

Section Description	Water Surface Elevation
Total loss = 0.01 ft	
24-inch Filter Feed (To Filter No. 4,5)	**143.5**
Pipe shape = Circular	
Diameter = 24 in	
Length = 102 ft	
Flow = 2.5 mgd	
Friction method = Manning's Equation	
Friction factor = 0.012	
Total fitting K value = 1.8	
Pipe area = 3.142 ft²	
Pipe hydraulic radius = 0.5	
Age factor = 1	
Solids factor = 1	
Velocity = 1.23 ft/s	
Units on-line = 1	
Total flow, all units = 2.5 mgd	
Friction loss = 0.03 ft	
Fitting loss = 0.04 ft	
Total loss = 0.07 ft	
24-inch Filter Feed (To Filter No. 3,4,5)	**143.65**
Pipe shape = Circular	
Diameter = 24 in	
Length = 102 ft	
Flow = 3.75 mgd	
Friction method = Manning's Equation	
Friction factor = 0.012	
Total fitting K value = 1.8	
Pipe area = 3.142 ft²	
Pipe hydraulic radius = 0.5	
Age factor = 1	
Solids factor = 1	
Velocity = 1.85 ft/s	
Units on-line = 1	
Total flow, all units = 3.7 mgd	
Friction loss = 0.06 ft	
Fitting loss = 0.1 ft	
Total loss = 0.15 ft	
24-inch Filter Feed (To Filter No. 2,3,4,5)	**144.3**
Pipe shape = Circular	
Diameter = 24 in	
Length = 175 ft	
Flow = 5 mgd	
Friction method = Manning's Equation	
Friction factor = 0.012	
Total fitting K value = 5.1	

Section Description	Water Surface Elevation
Pipe area = 3.142 ft² Pipe hydraulic radius = 0.5 Age factor = 1 Solids factor = 1 Velocity = 2.46 ft/s Units on-line = 1 Total flow, all units = 5 mgd Friction loss = 0.17 ft Fitting loss = 0.48 ft Total loss = 0.65 ft	
Partial Mix Cell No. 3 Channel Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 480 ft Channel width/diameter = 134 ft Flow = 5 mgd Downstream channel invert = 140.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 509.27 ft² Flow profile = Horizontal Normal depth = Infinite Critical depth = 0.047 ft Units on-line = 1 Total flow, all units = 5 mgd Depth downstream = 3.8 ft Bend loss = 0 ft Depth upstream = 3.8 ft Velocity = 0.02 ft/s	144.3
Partial Mix Cell No. 3 Weir Weir invert (top of weir) = 142 Weir length = 12 ft Weir height = 2 ft Weir 'C' coefficient = 3.295 Flow over weir = 5 mgd Weir submergence = fully submerged Units on-line = 1 Total flow, all units = 5 mgd Head over weir = 0.34 ft	144.32
Partial Mix Cell No. 2 Channel Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 480 ft Channel width/diameter = 90 ft Flow = 5 mgd	144.32

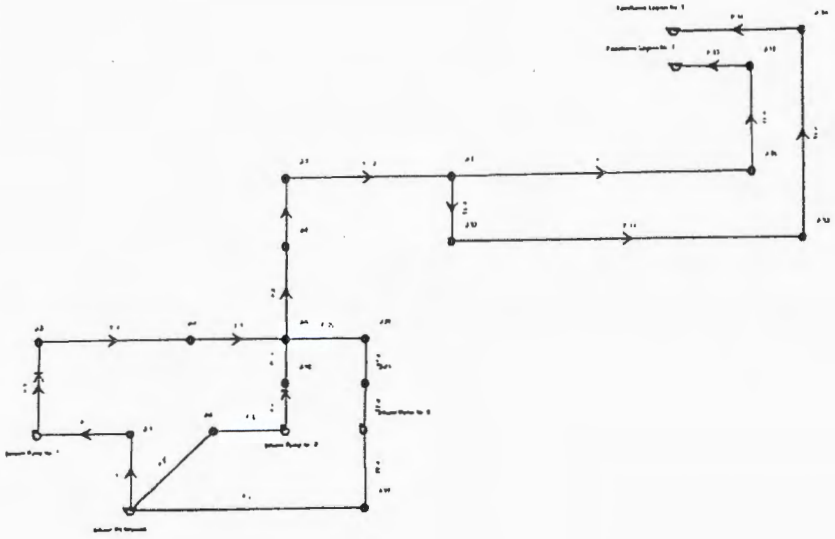
Section Description	Water Surface Elevation
Downstream channel invert = 140.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 344.03 ft² Flow profile = Horizontal Normal depth = Infinite Critical depth = 0.061 ft Units on-line = 1 Total flow, all units = 5 mgd Depth downstream = 3.82 ft Bend loss = 0 ft Depth upstream = 3.82 ft Velocity = 0.02 ft/s	
Partial Mix Cell No.2 Weir	**144.34**
Weir invert (top of weir) = 142 Weir length = 12 ft Weir height = 2 ft Weir 'C' coefficient = 3.237 Flow over weir = 5 mgd Weir submergence = fully submerged Units on-line = 1 Total flow, all units = 5 mgd Head over weir = 0.34 ft	
Partial Mix Cell No.1 Channel	**144.35**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 480 ft Channel width/diameter = 90 ft Flow = 5 mgd Downstream channel invert = 140.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 346.01 ft² Flow profile = Horizontal Normal depth = Infinite Critical depth = 0.061 ft Units on-line = 1 Total flow, all units = 5 mgd Depth downstream = 3.84 ft Bend loss = 0 ft Depth upstream = 3.85 ft Velocity = 0.02 ft/s	
Partial Mix Cell No.1 Weir	**144.37**
Weir invert (top of weir) = 142 Weir length = 12 ft	

Section Description	Water Surface Elevation
Weir height = 2 ft Weir 'C' coefficient = 3.295 Flow over weir = 5 mgd Weir submergence = fully submerged Units on-line = 1 Total flow, all units = 5 mgd Head over weir = 0.34 ft	
Complete Mix Cell No.1	**144.37**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 480 ft Channel width/diameter = 236 ft Flow = 5 mgd Downstream channel invert = 140.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 912.5 ft² Flow profile = Horizontal Normal depth = Infinite Critical depth = 0.032 ft Units on-line = 1 Total flow, all units = 5 mgd Depth downstream = 3.87 ft Bend loss = 0 ft Depth upstream = 3.87 ft Velocity = 0.01 ft/s	
Complete Mix Cell No.1 Weir	**144.39**
Weir invert (top of weir) = 142 Weir length = 12 ft Weir height = 2 ft Weir 'C' coefficient = 3.295 Flow over weir = 5 mgd Weir submergence = fully submerged Units on-line = 1 Total flow, all units = 5 mgd Head over weir = 0.34 ft	
Facultative Cell No.2 Channel	**144.39**
Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 480 ft Channel width/diameter = 320 ft Flow = 5 mgd Downstream channel invert = 140.5 Channel slope = 0 ft/ft Channel side slope = not applicable	

Section Description	Water Surface Elevation
Area of flow = 1244.32 ft² Flow profile = Horizontal Normal depth = Infinite Critical depth = 0.026 ft Units on-line = 1 Total flow, all units = 5 mgd Depth downstream = 3.89 ft Bend loss = 0 ft Depth upstream = 3.89 ft Velocity = 0.01 ft/s	
12-inch RCP (From Fac Lagoon 1 to Fac Cell 1) Pipe shape = Circular Diameter = 12 in Length = 30 ft Flow = 2.5 mgd Friction method = Manning's Equation Friction factor = 0.012 Total fitting K value = 3 Pipe area = 0.785 ft² Pipe hydraulic radius = 0.25 Age factor = 1 Solids factor = 1 Velocity = 4.92 ft/s Units on-line = 1 Total flow, all units = 2.5 mgd Friction loss = 0.3 ft Fitting loss = 1.13 ft Total loss = 1.43 ft	**145.82**
Facultative Lagoon No.1 Channel shape = Rectangular Manning's 'n' = 0.012 Channel length = 780 ft Channel width/diameter = 920 ft Flow = 5 mgd Downstream channel invert = 140.5 Channel slope = 0 ft/ft Channel side slope = not applicable Area of flow = 4894.87 ft² Flow profile = Horizontal Normal depth = Infinite Critical depth = 0.013 ft Units on-line = 1 Total flow, all units = 5 mgd Depth downstream = 5.32 ft Bend loss = 0 ft Depth upstream = 5.32 ft	**145.82**

Section Description	Water Surface Elevation
Velocity = 0 ft/s	

Scenario: High Head



FlexTable: Pipe Table (Timmonsville Influent Pump Station.wtg)

Current Time: 0.000 hours

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Has Check Valve?	Minor Loss Coefficient (Local)	Flow (MGD)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Has User Defined Length?	Length (User Defined) (ft)
30	P-1	50	Influent PS Wetwell	J-1	12.0	Ductile Iron	120.0	False	1.000	3	5.85	0.037	True	21
32	P-2	59	J-1	Influent Pump No. 1	12.0	Ductile Iron	120.0	False	0.000	3	5.85	0.011	True	5
37	P-3	61	Influent Pump No. 1	J-3	10.0	Ductile Iron	120.0	True	2.060	3	8.43	0.481	True	5
39	P-4	96	J-3	J-4	12.0	Ductile Iron	120.0	False	2.910	3	5.85	0.114	True	15
41	P-5	60	J-4	J-5	12.0	Ductile Iron	120.0	False	0.500	3	5.85	0.100	True	3
43	P-6	60	J-5	J-6	12.0	Ductile Iron	120.0	False	0.470	3	5.85	0.032	True	12
45	P-7	44	J-6	J-7	16.0	Ductile Iron	120.0	False	3.020	3	3.29	0.054	True	10
50	P-9	45	J-8	Influent Pump No. 2	12.0	Ductile Iron	120.0	False	0.000	0	0.00	0.000	True	5
53	P-10	31	Influent Pump No. 2	J-10	10.0	Ductile Iron	120.0	True	1.910	0	0.00	0.000	True	5
54	P-11	29	J-10	J-5	10.0	Ductile Iron	120.0	False	1.920	0	0.00	0.000	True	3
56	P-12	106	J-7	J-11	16.0	Ductile Iron	120.0	False	0.500	3	3.29	0.003	True	900
58	P-13	42	J-11	J-12	10.0	Ductile Iron	120.0	False	1.070	1	1.90	0.008	True	10
60	P-14	223	J-12	J-13	10.0	Ductile Iron	120.0	False	0.250	1	1.90	0.002	True	1,880
62	P-15	133	J-13	J-14	10.0	Ductile Iron	120.0	False	0.000	1	1.90	0.002	True	565
64	P-16	82	J-14	Facultative Lagoon No. 1	10.0	Ductile Iron	120.0	False	1.250	1	1.90	0.002	True	100
67	P-17	190	J-11	J-16	16.0	Ductile Iron	120.0	False	0.250	2	2.55	0.002	True	1,880
69	P-18	67	J-16	J-17	16.0	Ductile Iron	120.0	False	0.230	2	2.55	0.002	True	565
71	P-19	48	J-17	Facultative Lagoon No. 1	16.0	Ductile Iron	120.0	False	1.230	2	2.55	0.003	True	100
75	P-20	23	Influent PS Wetwell	J-8	12.0	Ductile Iron	130.0	False	1.000	0	0.00	0.000	True	21
79	P-21	149	Influent PS Wetwell	J-19	12.0	Ductile Iron	130.0	False	1.000	0	0.00	0.000	True	21
81	P-22	51	J-19	Influent Pump No. 3	12.0	Ductile Iron	130.0	False	0.000	0	0.00	0.000	True	5
84	P-23	30	Influent Pump No. 3	J-21	10.0	Ductile Iron	130.0	False	1.910	0	0.00	0.000	True	5
86	P-24	19	J-21	J-22	10.0	Ductile Iron	130.0	False	1.610	0	0.00	0.000	True	3
87	P-25	54	J-22	J-5	12.0	Ductile Iron	130.0	False	0.520	0	0.00	0.000	True	2

FlexTable: Junction Table (Timmonsville Influent Pump Station.wtg)

Current Time: 0.000 hours

ID	Label	Elevation (ft)	Zone	Demand Collection	Demand (MGD)	Hydraulic Grade (ft)	Pressure (psi)
29	J-1	126.83	<None>	<Collection: 0 items>	0	108.43	-8.0
35	J-3	130.41	<None>	<Collection: 0 items>	0	157.07	11.5
38	J-4	130.41	<None>	<Collection: 0 items>	0	155.36	10.8
40	J-5	130.41	<None>	<Collection: 0 items>	0	155.06	10.7
42	J-6	130.41	<None>	<Collection: 0 items>	0	154.67	10.5
44	J-7	120.41	<None>	<Collection: 0 items>	0	154.14	14.6
47	J-8	126.83	<None>	<Collection: 0 items>	0	109.20	-7.6
52	J-10	0.00	<None>	<Collection: 0 items>	0	155.06	67.1
55	J-11	0.00	<None>	<Collection: 0 items>	0	151.56	65.6
57	J-12	0.00	<None>	<Collection: 0 items>	0	151.49	65.5
59	J-13	0.00	<None>	<Collection: 0 items>	0	148.22	64.1
61	J-14	0.00	<None>	<Collection: 0 items>	0	147.24	63.7
66	J-16	0.00	<None>	<Collection: 0 items>	0	148.29	64.2
68	J-17	0.00	<None>	<Collection: 0 items>	0	147.30	63.7
78	J-19	0.00	<None>	<Collection: 0 items>	0	109.20	47.2
83	J-21	0.00	<None>	<Collection: 0 items>	0	155.06	67.1
85	J-22	0.00	<None>	<Collection: 0 items>	0	155.06	67.1

FlexTable: Pump Table (Timmonsville Influent Pump Station.wtg)

Current Time: 0.000 hours

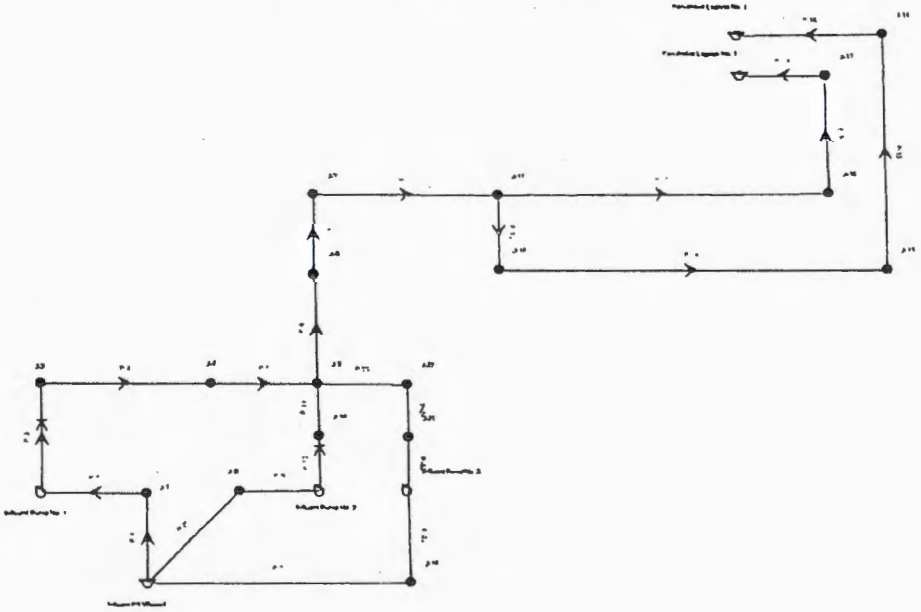
ID	Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (MGD)	Pump Head (ft)
33	Influent Pump No. 1	126.83	Gorman Rupp T10A-B-4	On	108.38	159.48	3	51.11
51	Influent Pump No. 2	126.83	Gorman Rupp T10A-B-4	Off	109.20	155.06	0	0.00
82	Influent Pump No. 3	126.83	Gorman Rupp T10A-B-4	Off	109.20	155.06	0	0.00

FlexTable: Reservoir Table (Timmonsville Influent Pump Station.wtg)

Current Time: 0.000 hours

ID	Label	Elevation (ft)	Zone	Flow (Out net) (MGD)	Hydraulic Grade (ft)
28	Influent PS Wetwell	109.20	<None>	3	109.20
65	Facultative Lagoon No. 1	147.00	<None>	-1	147.00
72	Facultative Lagoon No. 1	147.00	<None>	-2	147.00

Scenario: Low Head



FlexTable: Pipe Table (Timmonsville Influent Pump Station.wtg)

Current Time: 0.000 hours

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Has Check Valve?	Minor Loss Coefficient (Local)	Flow (MGD)	Velocity (ft/s)	Headloss Gradient (ft/ft)	Has User Defined Length?	Length (User Defined) (ft)
30	P-1	50	Influent PS Wetwell	J-1	12.0	Ductile Iron	140.0	False	1.000	3	6.24	0.03	True	21
32	P-2	59	J-1	Influent Pump No. 1	12.0	Ductile Iron	140.0	False	0.000	3	6.24	0.01	True	5
37	P-3	61	Influent Pump No. 1	J-3	10.0	Ductile Iron	140.0	True	2.060	3	8.99	0.540	True	5
39	P-4	96	J-3	J-4	12.0	Ductile Iron	140.0	False	2.910	3	6.24	0.12	True	15
41	P-5	60	J-4	J-5	12.0	Ductile Iron	140.0	False	0.500	3	6.24	0.11	True	3
43	P-6	60	J-5	J-6	12.0	Ductile Iron	140.0	False	0.470	3	6.24	0.03	True	12
45	P-7	44	J-6	J-7	16.0	Ductile Iron	140.0	False	3.020	3	3.51	0.00	True	10
50	P-9	45	J-8	Influent Pump No. 2	12.0	Ductile Iron	140.0	False	0.000	0	0.00	0.00	True	5
53	P-10	31	Influent Pump No. 2	J-10	10.0	Ductile Iron	140.0	True	1.910	0	0.00	0.00	True	5
54	P-11	29	J-10	J-5	10.0	Ductile Iron	140.0	False	1.920	0	0.00	0.00	True	3
56	P-12	106	J-7	J-11	16.0	Ductile Iron	140.0	False	0.500	3	3.51	0.01	True	900
58	P-13	42	J-11	J-12	10.0	Ductile Iron	140.0	False	1.070	1	2.03	0.04	True	10
60	P-14	223	J-12	J-13	10.0	Ductile Iron	140.0	False	0.250	1	2.03	0.01	True	1,880
62	P-15	113	J-13	J-14	10.0	Ductile Iron	140.0	False	0.000	1	2.03	0.01	True	565
64	P-16	82	J-14	Facultative Lagoon No. 1	10.0	Ductile Iron	140.0	False	1.250	1	2.03	0.02	True	100
67	P-17	190	J-11	J-16	16.0	Ductile Iron	140.0	False	0.290	2	2.72	0.01	True	1,880
69	P-18	67	J-16	J-17	16.0	Ductile Iron	140.0	False	0.230	2	2.72	0.02	True	565
71	P-19	48	J-17	Facultative Lagoon No. 1	16.0	Ductile Iron	140.0	False	1.230	2	2.72	0.03	True	100
75	P-20	73	Influent PS Wetwell	J-8	12.0	Ductile Iron	140.0	False	1.000	0	0.00	0.00	True	21
79	P-21	149	Influent PS Wetwell	J-19	12.0	Ductile Iron	130.0	False	1.000	0	0.00	0.00	True	21
81	P-22	51	J-19	Influent Pump No. 3	12.0	Ductile Iron	130.0	False	0.000	0	0.00	0.00	True	5
84	P-23	30	Influent Pump No. 3	J-21	10.0	Ductile Iron	130.0	False	1.910	0	0.00	0.00	True	5
86	P-24	29	J-21	J-22	10.0	Ductile Iron	130.0	False	1.650	0	0.00	0.00	True	3
87	P-25	51	J-22	J-5	12.0	Ductile Iron	130.0	False	0.520	0	0.00	0.00	True	2

FlexTable: Junction Table (Timmonsville Influent Pump Station.wtg)

Current Time: 0.000 hours

ID	Label	Elevation (ft)	Zone	Demand Collection	Demand (MGD)	Hydraulic Grade (ft)	Pressure (psi)
29	J-1	126.83	<None>	<Collection: 0 items>	0	110.10	-7.2
36	J-3	130.41	<None>	<Collection: 0 items>	0	156.35	11.2
38	J-4	130.41	<None>	<Collection: 0 items>	0	154.45	10.4
40	J-5	130.41	<None>	<Collection: 0 items>	0	154.12	10.3
42	J-6	130.41	<None>	<Collection: 0 items>	0	153.72	10.1
44	J-7	120.41	<None>	<Collection: 0 items>	0	153.12	14.2
47	J-8	126.83	<None>	<Collection: 0 items>	0	110.90	-6.9
52	J-10	0.00	<None>	<Collection: 0 items>	0	154.12	66.7
55	J-11	0.00	<None>	<Collection: 0 items>	0	150.91	65.3
57	J-12	0.00	<None>	<Collection: 0 items>	0	150.83	65.3
59	J-13	0.00	<None>	<Collection: 0 items>	0	148.06	64.1
61	J-14	0.00	<None>	<Collection: 0 items>	0	147.43	63.7
66	J-16	0.00	<None>	<Collection: 0 items>	0	148.14	64.1
68	J-17	0.00	<None>	<Collection: 0 items>	0	147.29	63.7
78	J-19	0.00	<None>	<Collection: 0 items>	0	110.90	48.0
83	J-21	0.00	<None>	<Collection: 0 items>	0	154.12	66.7
85	J-22	0.00	<None>	<Collection: 0 items>	0	154.12	66.7

FlexTable: Reservoir Table (Timmonsville Influent Pump Station.wtg)

Current Time: 0.000 hours

ID	Label	Elevation (ft)	Zone	Flow (Out net) (MGD)	Hydraulic Grade (ft)
28	Influent PS Wetwell	110.90	<None>	3	110.90
65	Facultative Lagoon No. 1	147.00	<None>	-1	147.00
72	Facultative Lagoon No. 1	147.00	<None>	-2	147.00

FlexTable: Pump Table (Timmonsville Influent Pump Station.wtg)

Current Time: 0.000 hours

ID	Label	Elevation (ft)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (ft)	Hydraulic Grade (Discharge) (ft)	Flow (Total) (MGD)	Pump Head (ft)
33	Influent Pump No. 1	126.83	Gorman Rupp T10A-B-4	On	110.05	159.05	3	49.00
51	Influent Pump No. 2	126.83	Gorman Rupp T10A-B-4	Off	110.90	154.12	0	0.00
82	Influent Pump No. 3	126.83	Gorman Rupp T10A-B-4	Off	110.90	154.12	0	0.00

Appendix C

Process Evaluation Technical Documentation

CDM Smith					
CLIENT	City of Florence, SC	JOB NO	8385-95572	DATE	10/1/13
PROJECT	Timmonsville POTW Consent Decree	DATE CHECKED	10/4/13	COMPUTED BY	AMB
DETAIL	Cover Sheet	CHECKED BY	BK		

Process Performance-System Analysis Calculations for City of Florence, SC Timmonsville WWTP

Process Description: Two facultative lagoons, one completely mixed lagoon, three partially mixed lagoons, five intermittent sand filters, two chlorine contactos.
Solving for effluent BOD, NH3-N, and TSS

1.0 Contents

1.1 Purpose/Objective: Determine if Timmonsvilel WWTP can meet effluent regulations based on current processes

1.2 Procedure/Approach: EPA Design Manual for stabilization ponds

1.3 Data and References: Please see data and references within each equation sheet.

1.4 Assumptions and Limitations:

1. Assumed TSS influent into facultative pond 2, completely mixed cell 1, partial mixed cells 1-3, intermittent filters
2. Assumed BOD loading influent into facultative pond 2, completely mixed cell 1, partial mixed cells 1-3, intermittent sand filters
3. Assumed NH3-N influent into facultative ponds 1-2, completely mixed cell 1, partial mixed cells 1-3, intermittent sand filters
4. Assumed wastewater temperature of facultative ponds 1-2, completely mixed cell 1, partial mixed cells 1-3, intermittent sand filters
5. Assumed wastewater pH of facultative ponds 1-2, compelely mixed cell 1, partial mixed cells 1-3, intermittent sand filters

1.5 Legend: The following text and cell color codes are used in this spreadsheet and indicate the following:

yellow shaded cell = value that requires manual input
text = black text = notes, equations, and results that do not need updating for typical calculations
( ) = parenthesis = notes, assumptions, or references to data sources

CDM Smith						
	CLIENT	City of Florence, SC	JOB NO.	8385-95572	DATE	10/1/13
	PROJECT	Timmonsville POTW Consent Decree	DATE CHECKED	10/4/2013	COMPUTED BY	AMB
	DETAIL	Equations	CHECKED BY	BK		

FACULTATIVE POND INFLUENT CALCULATIONS

Sample Influent Data

Date	Flow (mgd)	BOD Conc (mg/L)	BOD (lb/day)	TSS Conc (mg/L)	TSS (lb/day)
10/3/2012	1.1208	40	373.90	37.9	354.27
10/10/2012	0.5476	47.9	218.76	96	438.43
10/17/2012	0.6031	32.7	164.48	53.3	268.09
10/24/2012	0.5866	51.9	253.91	47	229.94
10/31/2012	0.5637	56.9	267.50	80	376.10
11/7/2012	0.464	45.4	175.69	74.5	288.30
11/14/2012	0.6497	48	260.09	64.5	349.49
11/20/2012	0.7742	66	426.15	118	761.91
11/30/2012	0.6493	45.6	246.93	55.5	300.54
Average	**0.66**	**48.27**	**265.27**	**69.63**	**374.12**

flow (ML/day)	2.51
avg BOD conc. from avg Q & avg load (mg/L)	48.04
avg TSS conc. From avg Q & avg load (mg/L)	67.75

CURRENT INFLUENT PLANT CONDITIONS @ 0.66 MGD

		ADF	ADMM	MD
Flow	ML/day	2.51		
	mgd	0.66		1.66
BOD	Peaking Factor[1]		1.4	1.65
	mg/L	48.0		
	lb/day	265.3	371.4	437.7
Flow	ML/day	2.51		
	mgd	0.66		
TSS	Peaking Factor[1]		1.4	1.85
	mg/L	67.8		
	lb/day	374.1	523.8	692.1
Flow	ML/day	2.51		
	mgd	0.66		
Ammonia[2]	Peaking Factor[3]		1.40	1.53
	mg/L	6.3		
	lb/day	35.0	49.0	53.6
TKN[3]	Peaking Factor[4]		1.40	1.53
	mg/L	9.61		14.6996546
	lb/day	53.1	74.3	81.2

2.5

1: Peaking Factor found using WEF Manual of Practice No. 8

2: assumed 66% of TKN

3: assumed 1/5 of BOD

4: assumed same as Ammonia

DESIGN INFLUENT PLANT CONDITIONS @ 2 MGD

		ADF	ADMM	MD	
Flow	ML/day	7.6			
	mgd	2.00		5.00	2.5
BOD	Peaking Factor		1.34	1.59	
	mg/L	48.0	64.3		
	lb/day	801.3	1072.7	1273.1	
Flow	ML/day	7.6			
	mgd	2.00			
TSS	Peaking Factor		1.33	1.81	
	mg/L	67.8			
	lb/day	1130.1	1501.6	2044.1	
Flow	ML/day	7.6			
	mgd	2.00			
Ammonia[2]	Peaking Factor		1.31	1.43	
	mg/L	6.3			
	lb/day	105.8	138.4	151.0	
TKN[3]	Peaking Factor[4]		1.31	1.43	
	mg/L	9.61	12.57	13.72	
	lb/day	160.3	209.7	228.9	572.13642

1: Peaking Factor found using WEF Manual of Practice No. 8

2: assumed 66% of TKN

3: assumed 1/5 of BOD

4: assumed same as Ammonia

CDM Smith						
	CLIENT	City of Florence, SC	JOB NO.	8385-95572	DATE	10/1/13
	PROJECT	Timmonsville POTW Consent Decree	DATE CHECKED	10/4/2013	COMPUTED BY	AMB
	DETAIL	Equations	CHECKED BY	BK		

BOD REMOVAL IN FACULTATIVE POND 1 @ 2 MGD (design ADF)

Avg. Flow	mgd	2
	ML/day	7.57
	m^3/day	7570
Pond Dimentions	Length (ft)	891
	Width (ft)	750
	Depth (ft)	4
Pond Surface Area	ft^2	668,250
	m^2	62,114
Pond Volume	ft^3	2,673,000
	m^3	75,749

Step [1]
BOD Loading Equation (Kayombo, et al., 2004, "Waste Stabilization Ponds and Const. Wetlands Design Manual" UNEP-IETC. Pg 22)

$\lambda_s = 10 \times L_i \times Q \div A_i$ where: λ_s = BOD loading, kg BOD/(ha*day)

L_i = influent BOD, mg/L = g/m^3 1072.74 lb/day (MM load)

Q = flow, m^3/day 7570

A = facultative pond area, m^2 62,114

Influent BOD (mg/L) = 64.31

Therefore: λ_s = 78.38 kg BOD/(ha*day)

69.96 lb BOD/acre*day)

Step [2]
BOD Removal Equation (Cairncross & Feachem, 1993, "Env. Health Eng. In the Tropics" Wiley. Pg 170)

$\lambda_r = 0.725 \times \lambda_s +$ 10.75 where: λ_r = BOD removal, kg BOD/(ha*day)

λ_s = BOD loading, kg BOD/(ha*day) 78.38

Therefore: λ_r = 67.58 kg BOD/(ha*day)

Step [3]
Convert to Effluent BOD

influent kg BOD/(ha*day) - removed kg BOD/(ha*day) = effluent BOD = 10.80 kg BOD/(ha*day)

Convert BOD= effluent kg BOD/(ha*day)*(1000g/kg)*(ha/10000m^2)/(1.23m) = #DIV/0! g BOD/(m^3*day)

X g BOD/(m^3*day) × 62,114 m^2 ÷ 10 ÷ Q m^3/day = 8.87 mg/l

147.87 lb/day

CDM Smith						
	CLIENT	City of Florence, SC	JOB NO.	8385-95572	DATE	10/1/13
	PROJECT	Timmonsville POTW Consent Decree	DATE CHECKED	10/4/2013	COMPUTED BY	AMB
	DETAIL	Equations	CHECKED BY	BK		

TKN REMOVAL IN FACULTATIVE POND 1 @ 2 MGD

Avg. Flow	mgd	2	
	ML/day	7.57	
	m^3/day	7570	
Pond Dimentions	Length (ft)	891	271.6463415 m
	Width (ft)	750	228.6585366 m
	Depth (ft)	4	1.219512195 m
Pond Surface Area	ft^2	668,250	
	m^2	62,114	
Pond Volume	ft^3	2,673,000	
	m^3	75,749	
NH3-N Influent*	mg/L	12.57	(max month TKN)*at ADF
	lb/day	138.38	
Temperature	°C	25	
		20	
		15.5	
		4.5	
pH	unitless	10	Maximum taken from Overflow Data
		7.86	Average taken from Overflow Data
		5.86	Minimum taken from Overflow Data

[1] At Temperatures 1°C-20°C

Ce/Co = 1/(1+(A/Q)*(0.0038+0.000134*T)*(e^(1.041+0.044*T)*(pH-6.6)))

from EPA-625/1-83-015 "Design Manual: Municipal Wastwater Stabilization Ponds" 1983

At pH 10	Ce =	0.34 mg/L	T = 20
		0.70 mg/L	T = 15.5
		3.65 mg/L	T = 4.5
At pH 7.86	Ce =	7.86 mg/L	T = 20
		8.83 mg/L	T = 15.5
		10.72 mg/L	T = 4.5
At pH 5.86	Ce =	12.41 mg/L	T = 20
		12.40 mg/L	T = 15.5
		12.39 mg/L	T = 4.5

[2] At Temperatures 21°C-25°C

Ce/Co = 1/(1+(A/Q)*(5.035*10^-3)*(e^(1.540)*(pH-6.6)))

from EPA-625/1-83-015 "Design Manual: Municipal Wastwater Stabilization Ponds" 1983

	Ce =	
At pH 10	Ce =	1.43 mg/L
At pH 7.86	Ce =	9.76 mg/L
At pH 5.86		12.41 mg/L

Conclusion: No removal at low pH

NH4-N effluent of 9.8 mg/L At average pH and assumed average Temp of 25.5 °C

CDM Smith						
	CLIENT	City of Florence, SC	JOB NO.	8385-95572	DATE	10/1/13
	PROJECT	Timmonsville POTW Consent Decree	DATE CHECKED	10/4/2013	COMPUTED BY	AMB
	DETAIL	Equations	CHECKED BY	BK		

BOD REMOVAL IN FACULTATIVE POND 2 @ 2 MGD

Avg. Flow	mgd	2
	ML/day	7.57
	m^3/day	7570
Pond Dimentions	Length (ft)	480
	Width (ft)	297
	Depth (ft)	4
Pond Surface Area	ft^2	142,560
	m^2	13,251
Pond Volume	ft^3	570,240
	m^3	16,160

Step [1]
BOD Loading Equation (Kayombo, et al., 2004, "Waste Stabilization Ponds and Const. Wetlands Design Manual" UNEP-IETC. Pg 22)

$\lambda_s = 10 \times L_i \times Q \div A_i$ where: λ_s = BOD loading, kg BOD/(ha*day)

L_i = influent BOD, mg/L = g/m^3 — 147.87 lb/day, From Equations (2a)

Q = flow, m^3/day — 7570

A = facultative pond area, m^2 — 13,251

Influent BOD (mg/L) = 8.87

Therefore: λ_s = 50.65 kg BOD/(ha*day)

45.20 lb BOD/(acre*day)

Step [2]
BOD Removal Equation (Cairncross & Feachem, 1993, "Env. Health Eng. In the Tropics" Wiley. Pg 170)

$\lambda_r = 0.725 \times \lambda_s +$ 10.75 where: λ_r = BOD removal, kg BOD/(ha*day)

λ_s = BOD loading, kg BOD/(ha*day) — 50.65

Therefore: λ_r = 47.47 kg BOD/(ha*day) Removed

Step [3]
Convert to Effluent BOD

Influent kg BOD/(ha*day) - removed kg BOD/(ha*day) = effluent BOD = 3.18 kg BOD/(ha*day)

Convert BOD= effluent kg BOD/(ha*day)*(1000g/kg)*(ha/10000m^2)/(1.23m) = #DIV/0! g BOD/(m^3*day)

X g BOD/(m^3*day) x 13,251 m^2 ÷ 10 ÷ Q m^3/day = 0.56 mg/l

9.28 lb/day Effluent

CDM Smith						
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	PROJECT	Timmonsville POTW Consent Decree	DATE CHECKED	10/4/2013	COMPUTED BY	AMB
	DETAIL	Equations	CHECKED BY	BK		

TKN REMOVAL IN FACULTATIVE POND 2 @ 2 MGD

Avg. Flow	mgd	2	
	ML/day	7.57	
	m^3/day	7570	
Pond Dimentions	Length (ft)	480	
	Width (ft)	297	
	Depth (ft)	4	
Pond Surface Area	ft^2	142,560	
	m^2	13,251	
Pond Volume	ft^3	570,240	
	m^3	16,160	
NH3-N Influent[1,2]	mg/L	8.83	(max month from facultative pond 1 effluent)
Temperature	°C	25	
	°C	20	
	°C	15.5	
	°C	4.5	
pH	unitless	10	Maximum taken from Overflow Data
	unitless	7.86	Average taken from Overflow Data
	unitless	5.86	Minimum taken from Overflow Data

1: Assumed same at 0.66 MGD and 2 MGD
2: Taken from effluent of facultative pond 1 at average pH and assumed average Temp

[1] At Temperatures 1°C-20°C

Ce/Co = 1/(1+(A/Q)*(0.0038+0.000134*T)*(e^(1.041+0.044*T)*(pH-6.6)))

from EPA-625/1-83-015 "Design Manual: Municipal Wastwater Stabilization Ponds" 1983

At pH 10	Ce =	1.01 mg/L	T = 20	
		1.92 mg/L	T = 15.5	
		5.81 mg/L	T = 4.5	
At pH 7.86	Ce =	7.83 mg/L	T = 20	
		8.10 mg/L	T = 15.5	135.1721369 lb/day
		8.52 mg/L	T = 4.5	
At pH 5.86	Ce =	8.81 mg/L	T = 20	
		8.81 mg/L	T = 15.5	
		8.81 mg/L	T = 4.5	

[2] At Temperatures 21°C-25°C

Ce/Co = 1/(1+(A/Q)*(5.035*10^-3)*(e^(1.540)*(pH-6.6)))

from EPA-625/1-83-015 "Design Manual: Municipal Wastwater Stabilization Ponds" 1983

At pH 10	Ce =	3.33 mg/L
At pH 7.86	Ce =	8.32 mg/L
At pH 5.86	Ce =	8.81 mg/L

Conclusion: Assume no removal at low pH.
At average pH and assumed average temp of 25.5 °C =8.3 mg/L effluent of NH4-N

CDM Smith					
CLIENT	City of Florence, SC	JOB NO	8385-95572	DATE	10/1/13
PROJECT	Timmonsville POTW Consent Decree	DATE CHECKED	10/4/13	COMPUTED BY	AMB
DETAIL	Cover Sheet	CHECKED BY	BK		

Process Performance-System Analysis Calculations for City of Florence, SC Timmonsville WWTP

Process Description: Two facultative lagoons, one completely mixed lagoon, three partially mixed lagoons, five intermittent sand filters, two chlorine contactors.
Solving for effluent BOD, NH4-N, and TSS

1.0 Contents

1.1 Purpose/Objective: Determine if Timmonsville WWTP can meet effluent regulations based on current processes

1.2 Procedure/Approach: EPA Design Manual for stabilization ponds

1.3 Data and References: Please see data and references within equation sheets

1.4 Assumptions and Limitations:

1. Assumed TSS influent into facultative pond 2, completely mixed cell 1, partial mixed cells 1-3, intermittent filters
2. Assumed BOD loading influent into facultative pond 2, completely mixed cell 1, partial mixed cells 1-3, intermittent sand filters
3. Assumed NH4-N influent into facultative ponds 1-2, completely mixed cell 1, partial mixed cells 1-3, intermittent sand filters
4. Assumed wastewater temperature of facultative ponds 1-2, completely mixed cell 1, partial mixed cells 1-3, intermittent sand filters
5. Assumed wastewater pH of facultative ponds 1-2, competely mixed cell 1, partial mixed cells 1-3, intermittent sand filters

1.5 Legend: The following text and cell color codes are used in this spreadsheet and indicate the following:

	yellow shaded cell = value that requires manual input
text	black text = notes, equations, and results that do not need updating for typical calculations
( )	Parenthesis = notes, assumptions, or references to data sources

CDM Smith						
	CLIENT	City of Florence, SC	JOB NO.	8385-95572	DATE	10/1/13
	PROJECT	Timmonsville POTW Consent Decree	DATE CHECKED	10/4/2013	COMPUTED BY	AMB
	DETAIL	Equations	CHECKED BY	BK		

FACULTATIVE POND INFLUENT CALCULATIONS

Sample Influent Data

Date	Flow (mgd)	BOD Conc (mg/L)	BOD (lb/day)	TSS Conc (mg/L)	TSS (lb/day)
10/3/2012	1.1208	40	373.90	37.9	354.27
10/10/2012	0.5476	47.9	218.76	96	438.43
10/17/2012	0.6031	32.7	164.48	53.3	268.09
10/24/2012	0.5866	51.9	253.91	47	229.94
10/31/2012	0.5637	56.9	267.50	80	376.10
11/7/2012	0.464	45.4	175.69	74.5	288.30
11/14/2012	0.6497	48	260.09	64.5	349.49
11/20/2012	0.7742	66	426.15	118	761.91
11/30/2012	0.6493	45.6	246.93	55.5	300.54
Average	**0.66**	**48.27**	**265.27**	**69.63**	**374.12**

flow (ML/day)	2.51
avg BOD conc. from avg Q & avg load (mg/L)	48.04
avg TSS conc. From avg Q & avg load (mg/L)	67.75

CURRENT INFLUENT PLANT CONDITIONS @ 0.66 MGD

		ADF	ADMM	MD
Flow	ML/day	2.51		
	mgd	0.66		1.66
BOD	Peaking Factor[1]		1.4	1.65
	mg/L	48.0		
	lb/day	265.3	371.4	437.7
Flow	ML/day	2.51		
	mgd	0.66		
TSS	Peaking Factor[1]		1.4	1.85
	mg/L	67.8		
	lb/day	374.1	523.8	692.1
Flow	ML/day	2.51		
	mgd	0.66		
Ammonia[2]	Peaking Factor[3]		1.40	1.53
	mg/L	6.3		
	lb/day	35.0	49.0	53.6
TKN[3]	Peaking Factor[4]		1.40	1.53
	mg/L	9.61		14.6996546
	lb/day	53.1	74.3	81.2

2.5

1: Peaking Factor found using WEF Manual of Practice No. 8

2: assumed 66% of TKN

3: assumed 1/5 of BOD

4: assumed same as Ammonia

DESIGN INFLUENT PLANT CONDITIONS @ 2 MGD

		ADF	ADMM	MD	
Flow	ML/day	7.6			
	mgd	2.00		5.00	2.5
BOD	Peaking Factor		1.34	1.59	
	mg/L	48.0	64.3	76.3	
	lb/day	801.3	1072.7	1273.1	
Flow	ML/day	7.6			
	mgd	2.00			
TSS	Peaking Factor		1.33	1.81	
	mg/L	67.8	90.0	122.5	
	lb/day	1130.1	1501.6	2044.1	
Flow	ML/day	7.6			
	mgd	2.00			
Ammonia[2]	Peaking Factor		1.31	1.43	
	mg/L	6.3	8.3	9.1	
	lb/day	105.8	138.4	151.0	
TKN[3]	Peaking Factor[4]		1.31	1.43	
	mg/L	9.61	12.57	13.72	
	lb/day	160.3	209.7	228.9	572.13642

CDM Smith						
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	DETAIL	Equations	CHECKED BY	BK		

BOD REMOVAL IN FACULTATIVE POND 1 @ 2 MGD (design ADF)

Avg. Flow	mgd	2	
	ML/day	7.57	
	m^3/day	7570	
Pond Dimentions	Length (ft)	891	
	Width (ft)	750	
	Depth (ft)	4	1.12 meters
Pond Surface Area	ft^2	668,250	
	m^2	62,114	
Pond Volume	ft^3	2,673,000	
	m^3	75,749	

Step [1]
BOD Loading Equation (Kayombo, et al., 2004, "Waste Stabilization Ponds and Const. Wetlands Design Manual" UNEP-IETC. Pg 22)

$\lambda_s = 10 \times L_i \times Q \div A_i$

where: λ_s = BOD loading, kg BOD/(ha*day)

L_i = influent BOD, mg/L = g/m^3 — 1273.06 lb/day (MD load)

Q = flow, m^3/day — 7570

A = facultative pond area, m^2 — 62,114

Influent BOD (mg/L) = 76.32

Therefore: λ_s = 93.02 kg BOD/(ha*day)

83.02 lb BOD/acre*day)

Step [2]
BOD Removal Equation (Cairncross & Feachem, 1993, "Env. Health Eng. In the Tropics" Wiley. Pg 170)

$\lambda_r = 0.725 \times \lambda_s +$ 10.75

where: λ_r = BOD removal, kg BOD/(ha*day)

λ_s = BOD loading, kg BOD/(ha*day) — 93.02

Therefore: λ_r = 78.19 kg BOD/(ha*day)

Step [3]
Convert to Effluent BOD

influent kg BOD/(ha*day) - removed kg BOD/(ha*day) = effluent BOD = 14.83 kg BOD/(ha*day)

Convert BOD= effluent kg BOD/(ha*day)*(1000g/kg)*(ha/10000m^2)/(1.23m) = 1.32 g BOD/(m^3*day)

X g BOD/(m^3*day) × 62,114 m^2 ÷ 10 ÷ Q m^3/day = 12.17 mg/l

202.96 lb/day

CDM Smith						
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	DETAIL	Equations	CHECKED BY	BK		

NH3-N REMOVAL IN FACULTATIVE POND 1 @ 2 MGD

Avg. Flow	mgd	2	
	ML/day	7.57	
	m^3/day	7570	
Pond Dimentions	Length (ft)	891	
	Width (ft)	750	
	Depth (ft)	4	
Pond Surface Area	ft^2	668,250	
	m^2	62,114	
Pond Volume	ft^3	2,673,000	
	m^3	75,749	
NH3-N Influent*	mg/L	13.72	(max day TKN) *at ADF
Temperature	°C	25	
		20	
		15.5	
		4.5	
pH	unitless	10	Maximum taken from Overflow Data
		7.86	Average taken from Overflow Data
		5.86	Minimum taken from Overflow Data

[1] At Temperatures 1°C-20°C

Ce/Co = 1/(1+(A/Q)*(0.0038+0.000134*T)*(e^(1.041+0.044*T)*(pH-6.6)))

from EPA-625/1-83-015 "Design Manual: Municipal Wastewater Stabilization Ponds" 1983

At pH 10	Ce =	0.37	T = 20
		0.77	T = 15.5
		3.99	T = 4.5
At pH 7.86	Ce =	8.58	T = 20
		9.64	T = 15.5
		11.71	T = 4.5
At pH 5.86	Ce =	13.55	T = 20
		13.54	T = 15.5
		13.52	T = 4.5

[2] At Temperatures 21°C-25°C (Average)

Ce/Co = 1/(1+(A/Q)*(5.035*10^-3)*(e^(1.540)*(pH-6.6)))

from EPA-625/1-83-015 "Design Manual: Municipal Wastewater Stabilization Ponds" 1983

At pH 10	Ce =	1.57
At pH 7.86	Ce =	10.66
At pH 5.86	Ce =	13.54

Conclusion: No removal at low pH

NH3-N effluent of 10.66 mg/L At average pH and assumed average Temp of 25.5 °C

CDM Smith						
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	DETAIL	Equations	CHECKED BY	BK		

BOD REMOVAL IN FACULTATIVE POND 2 @ 2 MGD

Avg. Flow	mgd	2	
	ML/day	7.57	
	m^3/day	7570	
Pond Dimentions	Length (ft)	480	146.3414634 m
	Width (ft)	297	90.54878049 m
	Depth (ft)	4	1.219512195 m
Pond Surface Area	ft^2	142,560	
	m^2	13,251	
Pond Volume	ft^3	570,240	
	m^3	16,160	

Step [1]
BOD Loading Equation (Kayombo, et al., 2004, "Waste Stabilization Ponds and Const. Wetlands Design Manual" UNEP-IETC. Pg 22)

$\lambda_s = 10 \times L_i \times Q \div A_i$ where: λ_s = BOD loading, kg BOD/(ha*day)

L_i = influent BOD, mg/L = g/m^3 — 202.96 lb/day, From Equations (2a)

Q = flow, m^3/day — 7570

A = facultative pond area, m^2 — 13,251

Influent BOD (mg/L) = 12.17

Therefore: λ_s = 69.51 kg BOD/(ha*day)

62.04 lb BOD/(acre*day)

Step [2]
BOD Removal Equation (Cairncross & Feachem, 1993, "Env. Health Eng. In the Tropics" Wiley. Pg 170)

$\lambda_r = 0.725 \times \lambda_s +$ 10.75

where: λ_r = BOD removal, kg BOD/(ha*day)

λ_s = BOD loading, kg BOD/(ha*day) — 69.51

Therefore: λ_s = 61.15 kg BOD/(ha*day) Removed

Step [3]
Convert to Effluent BOD

Influent kg BOD/(ha*day) - removed kg BOD/(ha*day) = effluent BOD = 8.37 kg BOD/(ha*day)

Convert BOD= effluent kg BOD/(ha*day)*(1000g/kg)*(ha/10000m^2)/(1.23m) = 0.69 g BOD/(m^3*day)

X g BOD/(m^3*day) × 13,251 m^2 ÷ 10 ÷ Q m^3/day = 1.46 mg/l

24.43 lb/day Effluent

CDM Smith	CLIENT	City of Florence, SC	JOB NO.	8385-95572	DATE	10/1/13
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	DETAIL	Equations	CHECKED BY	BK		

TKN REMOVAL IN FACULTATIVE POND 2 @ 2 MGD

Avg. Flow	mgd	2	
	ML/day	7.57	
	m^3/day	7570	
Pond Dimentions	Length (ft)	480	
	Width (ft)	297	
	Depth (ft)	4	
Pond Surface Area	ft^2	142,560	
	m^2	13,251	
Pond Volume	ft^3	570,240	
	m^3	16,160	
NH3-N Influent[1, 2]	mg/L	10.66	(max day TKN from facultative pond 1 effluent)
Temperature	°C	25	
	°C	20	
	°C	15.5	
	°C	4.5	
pH	unitless	10	Maximum taken from Overflow Data
	unitless	7.86	Average taken from Overflow Data
	unitless	5.86	Minimum taken from Overflow Data

1: Assumed same at 0.66 MGD and 2 MGD
2: Taken from effluent of facultative pond 1 at average pH and assumed average Temp

[1] At Temperatures 1°C-20°C

Ce/Co = 1/(1+(A/Q)*(0.0038+0.000134*T)*(e^(1.041+0.044*T)*(pH-6.6)))

from EPA-625/1-83-015 "Design Manual: Municipal Wastwater Stabilization Ponds" 1983

At pH 10	Ce =	1.21	T = 20
		2.32	T = 15.5
		7.01	T = 4.5
At pH 7.86	Ce =	9.45	T = 20
		9.78	T = 15.5
		10.28	T = 4.5
At pH 5.86	Ce =	10.63	T = 20
		10.63	T = 15.5
		10.63	T = 4.5

163.0990318 lb/day

[2] At Temperatures 21°C-25°C

Ce/Co = 1/(1+(A/Q)*(5.035*10^-3)*(e^(1.540)*(pH-6.6)))

from EPA-625/1-83-015 "Design Manual: Municipal Wastwater Stabilization Ponds" 1983

At pH 10	Ce =	4.01
At pH 7.86	Ce =	10.04
At pH 5.86	Ce =	10.63

Conclusion: Assume no removal at low pH.
At average pH and assumed average temp of 25.5 °C =9.8 mg/L effluent of NH4-N

CDM Smith						
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	DETAIL	Equations	CHECKED BY	BK		

BOD REMOVAL IN COMPLETE MIX CELL 1 @ 2 MGD

Avg. Flow	mgd	2	
	ML/day	7.57	
	m^3/day	7570	
Pond Dimentions	Length (ft)	480	
	Width (ft)	236	
	Depth (ft)	4	
Pond Surface Area	ft^2	113,280	
	m^2	10,529	
Pond Volume	ft^3	453,120	
	m^3	12,841	
Time	V/Q =	0.00 days	
Assumptions	mechanical surface aerators (lb O_2/hp-hr)	3	(from EPA "Wastewater Tech Fact Sheet" 2002)
	1.5 kg Oxygen to treat 1 kg BOD	1.5	(from EPA "Wastewater Tech Fact Sheet" 2002)
	4.6 lb Oxygen to treat 1 lb TKN	4.6	

Step [1]
Correction Factor

("Activated Sludge Guidelines", CDM Smith 2007)

$OTE_{field} = SOTW * ((\beta\tau\Omega C_{sc} - C)/C_{sc}) * \alpha * \theta$

where: OTE_{field}, oxygen transfer rate (mg/L per time)

SOTW, standard oxygen transfer efficiency

β, O2 solubility corection factor	=	0.95
τ, temp correction	=	0.91
Ω, pressure ratio	=	1
Csc, standard DO saturation (mg/L)	=	9.09
C, minimum DO (mg/L)	=	2
α. mass transfer corrector	=	0.9
θ, temp correction	=	1.15

$OTE_{field}/SOTW$ | 0.67

Step [2]
Required Oxygen

(BOD load * treatment factor) + (TKN * treatment factor) ÷ Correction Factor = Oxygen Required

BOD Load at end of facultative pond 2 (lb/day) = 24.43 1.46443529 mg/l

TKN load at end of facultative pond 2[1] (lb/day) = 228.85 (max day load)

NOTE: 1: assumed neglegible removal in facultative ponds

Oxygen Required (SOR) = | 1633.2 lb O_2 / day

Step [3]

Supplied Oxygen from Floating Mechanical Aerators

Cell #1 HRT:	0.00	days	
	0.00	hrs	
	0.00	yrs	
HP of each aerator:	20	hp	
	20	hp at 100% efficency	
Number of aerators:	5	number	
Total cell HP:	100	(at 100% efficency)	120

Supplied O2 dose= required oxygen (lb O2/(HP*hr)) * total HP in cell *conversion

7200 lb O_2/day STD 8640

Step [4]
Analysis of Sufficient Oxygen Supplied

Excess O_2 = Supplied STD O2 - Required STD O2

5567 lb O_2/day Greater than zero check: yes

Step [5]
BOD effluent using design criteria equation (effluent when sufficient O2)

$C_e = C_o/[1+(K_T)(t)/n]^n$ (EPA "Wastewater Technology Fact Sheet: Aerated/Partial Mix Lagoons" 2002)

where: Ce = effluent BOD
Co = influent BOD
K_T = temp rate const., $K_{20}^{(T-20)}$ with T = temp of water; with K_{20} = 1.085
t = total detention time in system
n = number of equal sized cells in system

Co (lb/day) =	24.43	
T (degrees C) =	25	maximum temp of water (~80°F)
	15.5	average temp of water (~60°F)
	4	minimum temp of water (~40°F)
K_T =	3.76	maximum
	1.73	average
	0.68	minimum
t (days)=	0.00	
n (number of cells)=	1	

BOD effluent: Ce =

24.43 lb/day at maximum temp
24.43 lb/day at average temp
24.43 lb/day at minimum temp 1.46 mg/L

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	DETAIL	Equations	CHECKED BY	BK		

BOD REMOVAL IN COMPLETE MIX CELL 1 @ 2 MGD

Avg. Flow	mgd	2
	ML/day	7.57
	m^3/day	7570
Pond Dimentions	Length (ft)	480
	Width (ft)	90
	Depth (ft)	4
Pond Surface Area	ft^2	43,200
	m^2	4,015
Pond Volume	ft^3	172,800
	m^3	4,897
Time	A/Q =	0.00 days

Assumptions	mechanical surface aerators (lb O_2/hp-hr)	3	(from EPA "Wastewater Tech Fact Sheet" 2002)
	1.5 kg Oxygen to treat 1 kg BOD	1.5	(from EPA "Wastewater Tech Fact Sheet" 2002)
	4.6 lb Oxygen to treat 1 lb TKN	4.6	

Step [1]

Correction Factor ("Activated Sludge Guidelines", CDM Smith 2007)

$OTE_{field} = SOTW * ((\beta\tau\Omega C_{sc} - C)/C_{sc}) * \alpha * \theta$

where: OTE_{field}, oxygen transfer rate (mg/L per time)

SOTW, standard oxygen transfer efficiency

β, O2 solubility correction factor	=	0.95
τ, temp correction	=	0.91
Ω, pressure ratio	=	1
Csc, standard DO saturation (mg/L)	=	9.09
C, minimum DO (mg/L)	=	2
α, mass transfer corrector	=	0.9
θ, temp correction	=	1.15

OTE_{field}/SOTW = 0.67

Step [2]

Required Oxygen

(BOD load * treatment factor) + (TKN * treatment factor) ÷ Correction Factor = Oxygen Required

BOD Load at end of Comp. Mix 1 (lb/day) =	24.43	1.46443529 mg/L
TKN load at end of Comp. Mix 1[1] (lb/day) =	228.85 (max day load)	

NOTE: 1: assumed neglegible removal in aeration ponds due to short detention times

Oxygen Required (SOR) = 1633.2 lb O_2 / day

Step [3]
Supplied Oxygen from Floating Mechanical Aerators

Cell #1 HRT:	0.00	days	
	0.00	hrs	
	0.00	yrs	
HP of each aerator:	3	hp	
	3	hp at 100% efficency	3
Number of aerators:	3	number	2
Total cell HP:	9	(at 90% efficency)	6

Supplied O2 dose= required oxygen (lb O2/(HP*hr)) * total HP in cell *conversion

648	lb O_2/day SOR
432	firm capacity, SOR

Step [4]
Analysis of Sufficient Oxygen Supplied

Excess O_2 = Supplied STD O2 - Required STD O2

-985 lb O_2/day

Greater than zero check: no
Therefore, partial mixing.

Step [5]
BOD effluent using design criteria equation (effluent when sufficient O2)

$C_e = C_o/[1+(K_T)(t)/n]^n$ (EPA "Wastewater Technology Fact Sheet: Aerated/Partial Mix Lagoons" 2002)

where:
Ce = effluent BOD
Co = influent BOD
K_T = temp rate const., $K_{20}^{(T-20)}$ with T = temp of water; with K_{20} = 1.036 (for partial mixed)
t = total detention time in system
n = number of equal sized cells in system

Co (lb/day) =	1.46	
T (degrees C) =	25	maximum temp of water (~80°F)
	15.5	average temp of water (~60°F)
	4	minimum temp of water (~40°F)
K_T =	0.33	maximum
	0.24	average
	0.16	minimum
t (days)=	0.00	
n (number of cells)=	3	

BOD effluent: Ce =

1.46	lb/day	at maximum temp
1.46	lb/day	at average temp
1.46	lb/day	at minimum temp

0.09 mg/l

CDM Smith						
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	DETAIL	Equations	CHECKED BY	BK		

TSS REMOVAL IN INTERMITTENT SAND FILTERS @ 2 MGD

Avg. Flow	mgd	2		
	ML/day	7.57		
	m^3/day	7570		
Number of filters	unitless	5		
Filter Dimentions	Length (ft)	420		
	Width (ft)	100		
	Depth (ft)	3.7		
Filter Surface Area	ft^2	42,000		
	m^2	3,904		
Filter Volume	ft^3	155,400		
	m^3	4,404		
Time	V/Q =	2.91 days		
Time (one out-of-service)		2.33 days		
Hydraulic Loading Ra	Q/A =	0.39 m3/m2/day	9.52 gal/ft2/day	
HLR (one out-of-service)		0.48 m3/m2/day	11.90 gal/ft2/day	

According to "EPA Design Manual: Municipal Wasteewater Stabilization Ponds" EPA-625/1/83/015:

Areas where high influent SS concentrations are anticipated (above 50 mg/L average), lower hydraulic loading rates, 0.19 to 0.37 m3/m2/d are recommended. When effluent quality of TSS = or < 30 mg/L, single stage filter withh medium filter sand size (0.15-0.3 mm diam.) will produce a resonable filter run length and the required effluent quality.

Therefore: A conservative assumption of a TSS entering the filter to be the same as the TSS entering the plant

$TSS_{average}$ = 122.55 mg/L at 0.66 MGD and 2 MGD

Table 5-2 in the same report shows typical TSS Intermittent Sand Filtration effluent after aerated ponds. The % removal ranges from 52-67%. A conservative number of 52% removal was chosen.

TSS effluent from filter =	TSS influent * .52 = TSS removed =	63.72 mg/L
	TSS effluent from filter =	58.82 mg/L

While this falls just above the regulatory limit of 30 mg/L, current effluent measurements from the filter show that the effluent falls below this regulation at roughly **3.3 mg/L**. It is likely that the assumption of the filter influent TSS is very high; however, since no samples were made to taken of the filter influent and algae growth within the ponds greatly affect the TSS, influent TSS to the plant was the best assumption

CDM Smith						
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	DETAIL	Equations	CHECKED BY	BK		

CONTACT TIME OF CHLORINE CONTACTORS

Avg. Flow	mgd	2
	ML/day	7.57
	m^3/day	7570
Peak Flow	mgd	5
	ML/day	18.925
	m3/day	18925
Number of contactor	unitless	2
Dimentions	Length (ft)	156
	Width (ft)	4
	Depth (ft)	6
Contactor Surface Ar	ft^2	624
	m^2	58
Volume per Contactc	ft^3	3,744
	m^3	106
Time	V/Q =	0.03 days
Time (one out-of-service)		0.01 days
REGULATIONS:	for ADF	30 min
	For Peak	15 min

CONTACT TIME OF CHLORINE CONTACTORS @ 2 mgd

T = volume * baffle factor / flow rate

volume of tank[1] (m3)	212
flow rate (m3/day)	7570
conversion	1440 min/day

1: assumed 2 basins in service

T = 40.37 min

Meets 30 min requirement? yes

CONTACT TIME OF CHLORINE CONTACTORS @ 5 mgd

T = volume * baffle factor / flow rate

volume of tank[1] (m3)	106
flow rate (m3/day)	18925
50% peak flow rate (m3/day)	9462.5
conversion	1440 min/day

1: assumed only one basin in service

T = 16.15 min

Meets 15 min requirement? yes

CDM Smith						
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	DETAIL	Equations	CHECKED BY	BK		

EPA POINT SYSTEM

EPA, Handbook of Improving POTW Performance Using the Composite Correction Program Approach, 1984, EPA-625/6-84-008.

Avg. Flow	mgd	2
	ML/day	7.57
	m^3/day	7570
Pond Dimentions	Length (ft)	480
	Width (ft)	236
	Depth (ft)	4
Pond Surface Area	ft^2	113,280
	m^2	10,529
Pond Volume	ft^3	453,120
	m^3	12,841
Time	V/Q =	1.70 days

Assumptions	mechanical surface aerators (lb O_2/hp-hr)	3	(from EPA "Wastewater Tech Fact Sheet" 2002)
	1.5 kg Oxygen to treat 1 kg BOD	1.5	(from EPA "Wastewater Tech Fact Sheet" 2002)
	4.6 lb Oxygen to treat 1 lb TKN	4.6	

Correction Factor ("Activated Sludge Guidelines", CDM Smith 2007)

$OTE_{field} = SOTW * ((\beta\tau\Omega C_{sc} - C)/C_{sc}) * \alpha * \theta$

where: OTE_{field}, oxygen transfer rate (mg/L per time)

SOTW, standard oxygen transfer efficiency

β, O2 solubility corection factor	=	0.95
τ, temp correction	=	0.91
Ω, pressure ratio	=	1
Csc, standard DO saturation (mg/L)	=	9.09
C, minimum DO (mg/L)	=	2
α, mass transfer corrector	=	0.9
θ, temp correction	=	1.15

OTE_{field}/SOTW 0.67

BOD Load at end of facultative pond 2 (lb/day) = 24.43 at max day

These Calculations assume the use of Completely Mixed Cell No. 1 only

STEP [1]

Hydraulic Detention Time V/Q = t = 1.70 days | 40.76 hours

STEP [2]

Organic Loading at Max Day BOD loading/V = | 0.05 lb/day/1000 ft^3

STEP [3]

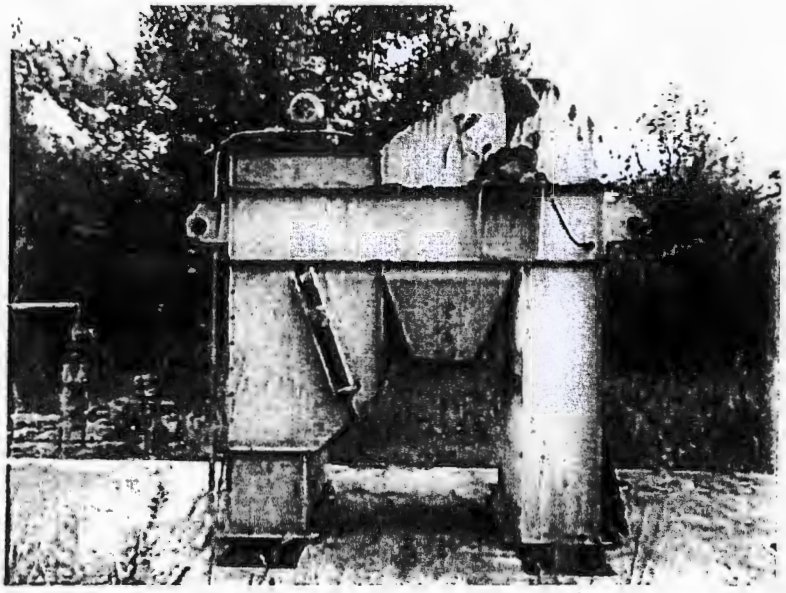
Oxygen Availability O2 transfer capacity/BOD loading = | 131.06 lb O2/lb BOD

HP of each aerator: 20 hp

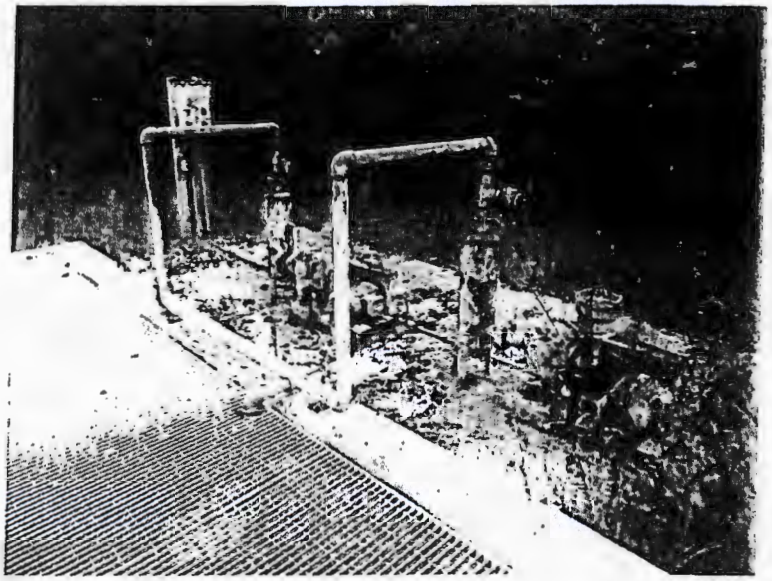
20 hp at 100% efficency

Number of aerators: 5 number
Total cell HP: 100 (at 100% efficency)

Supplied O2 dose= required oxygen (lb O2/(HP*hr)) * total HP in cell *conversion
7200 lb O_2/day STD

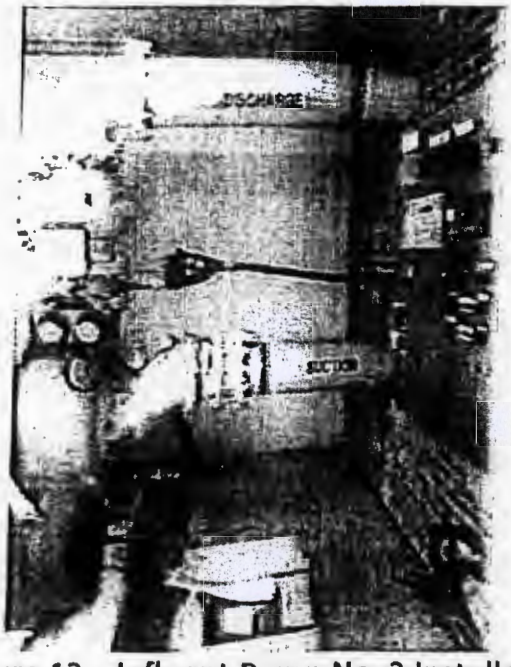


Picture 9 – Existing Chain and Bucket Grit Escalator Severely Corroded and Inoperable



Picture 10 – Existing Grit Pumps Severely Corroded and Inoperable

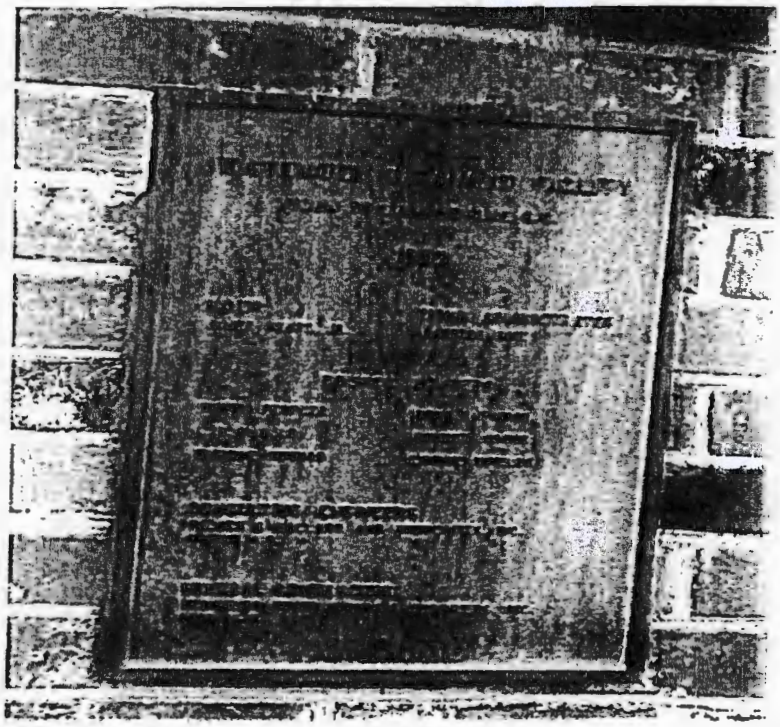
Picture 11 - Corroded Headworks Control Panel



Picture 12 – Influent Pump No. 3 Installed in 2008

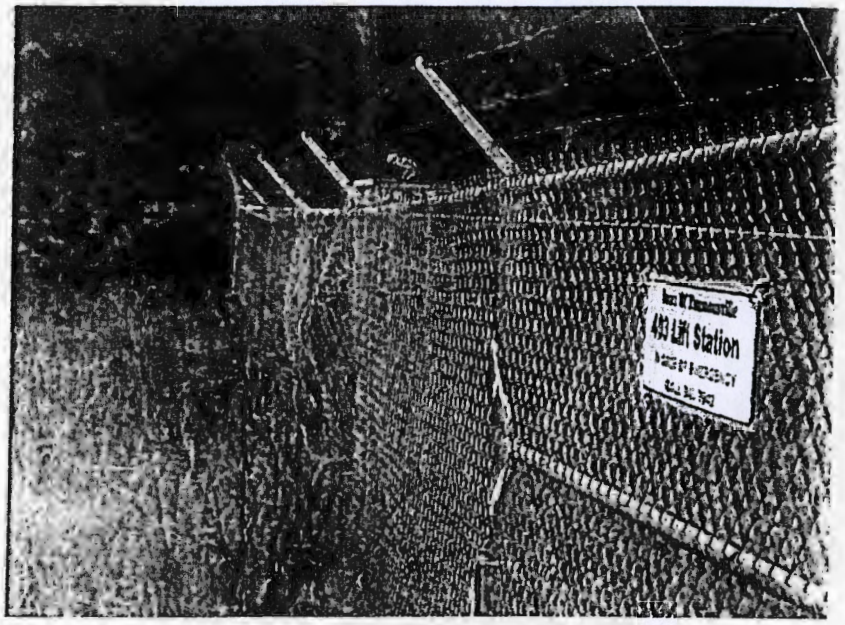
Appendix D

Site Inspection Photos



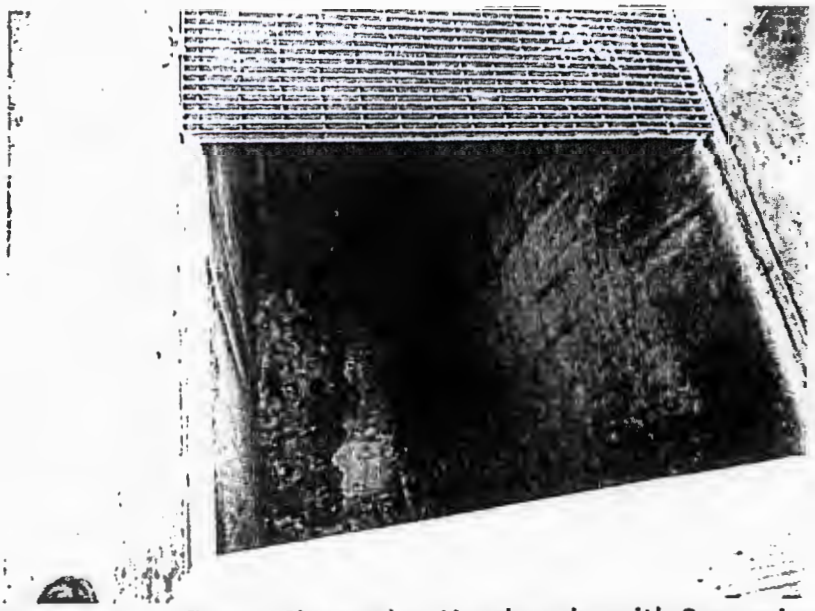
Picture 1 – Timmonsville WWTP Constructed in 1987

Picture 2 – Manhole Outside of Influent Pump Station

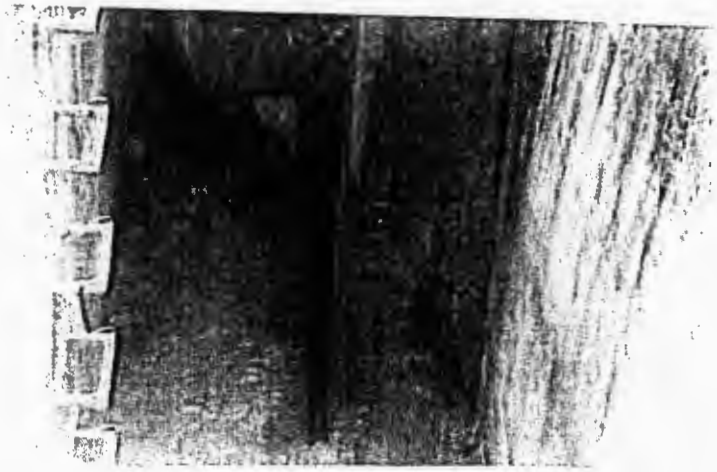


Picture 3 – Damaged Perimeter Chain-Link Fence

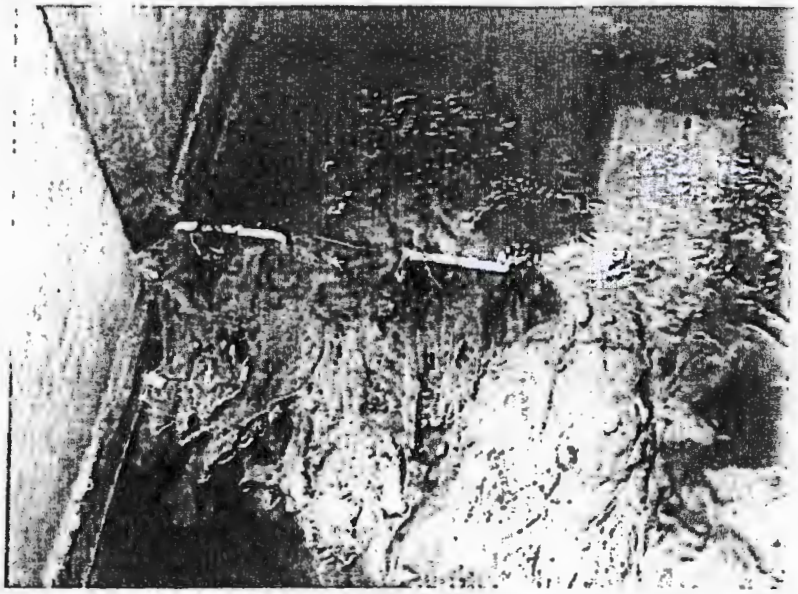
Picture 4 – Overgrown Vegetation at the Influent Pump Station



Picture 5 - Influent Channel at Headworks with Screening Deposits

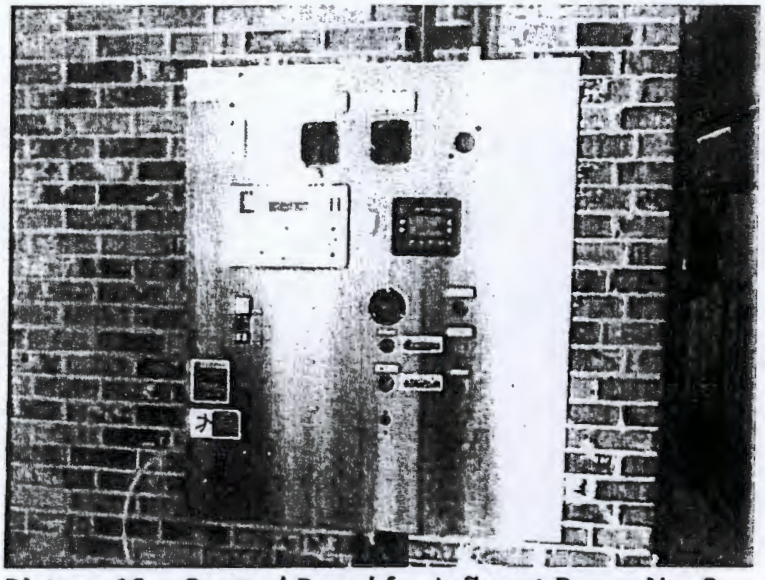


Picture 6 – Obstructed Flow in Headworks Channel and Corroded Mechanical Bar Screen flights.

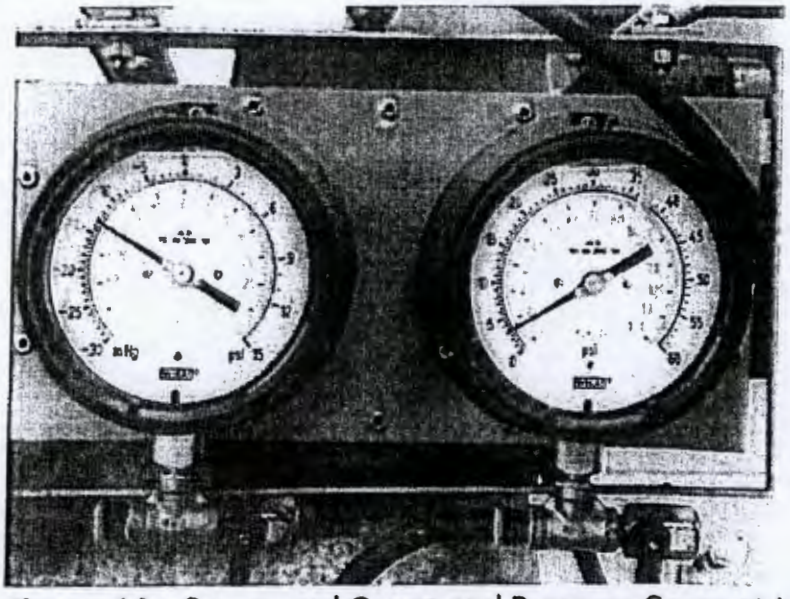


Picture 7 - Screenings Buildup in Headworks Channel

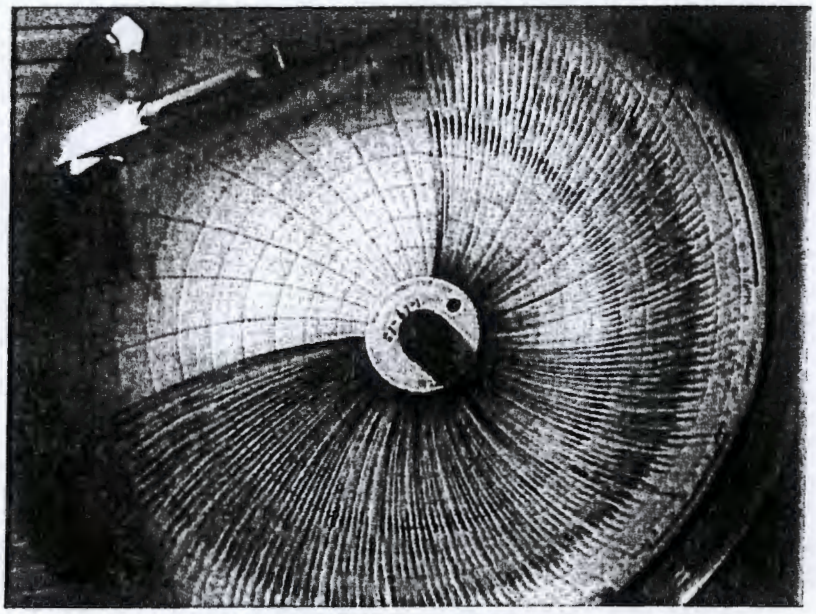
Picture 8 – Existing Mechanical Bar Screen Severely Corroded and Inoperable.



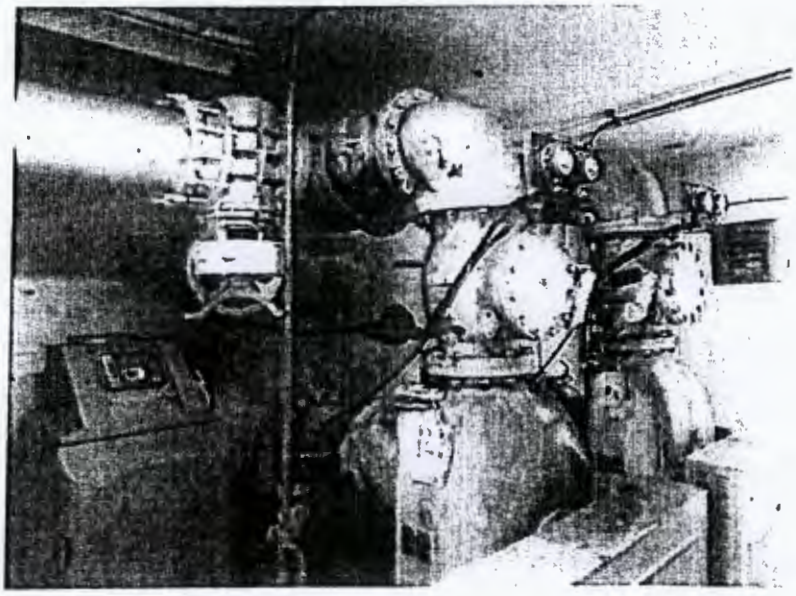
Picture 13 – Control Panel for Influent Pump No. 3



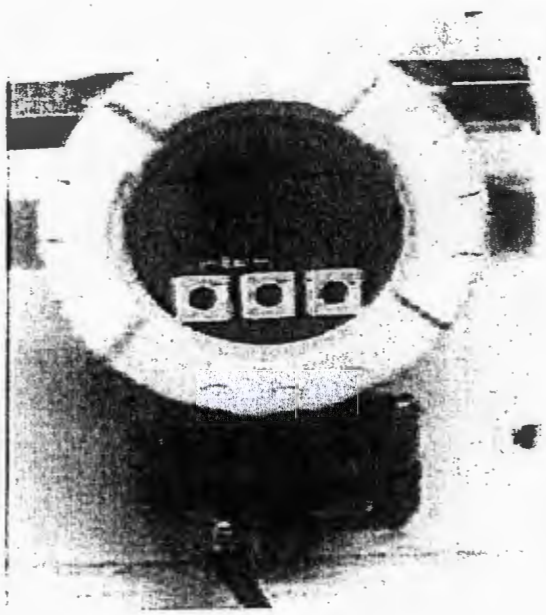
Picture 14 – Compound Gauge and Pressure Gauge at Influent Pump No. 3



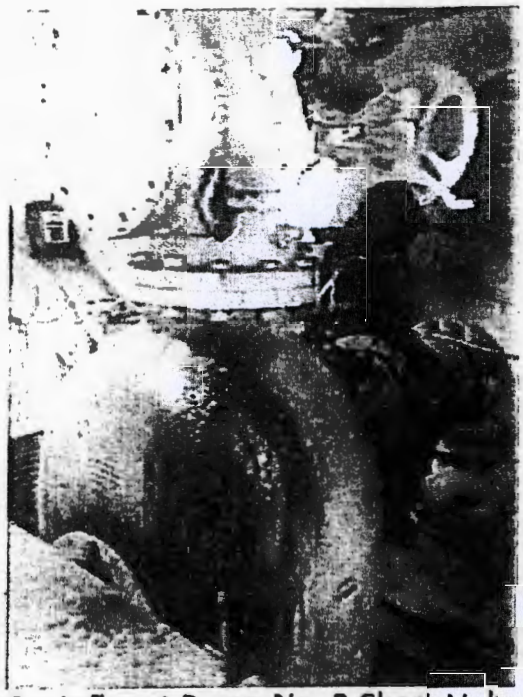
Picture 15 - Chart Recorder in Influent Pump Station



Picture 16 – Influent Pump No. 1 (far) and 2 (near) Installed in 1987

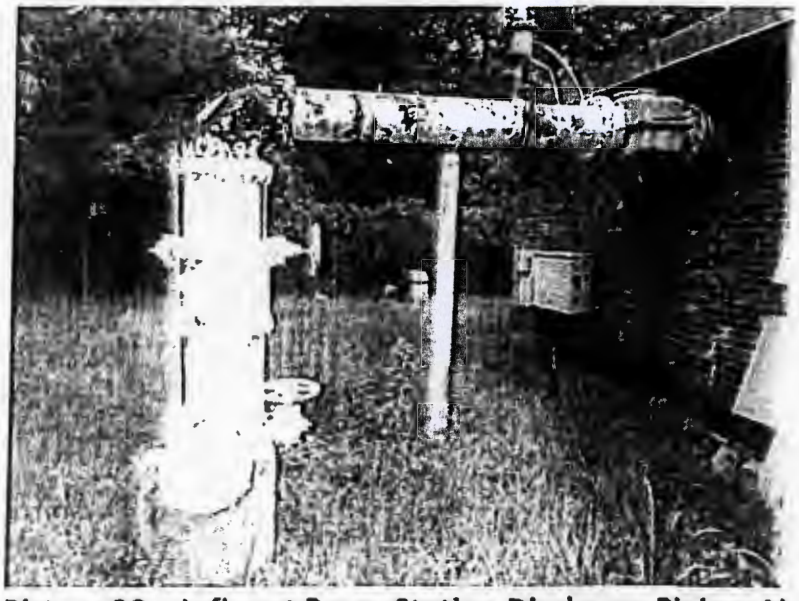


Picture 17 - Flow Meter Reading 1,590.7 gpm (2.3 mgd) - One Pump Running

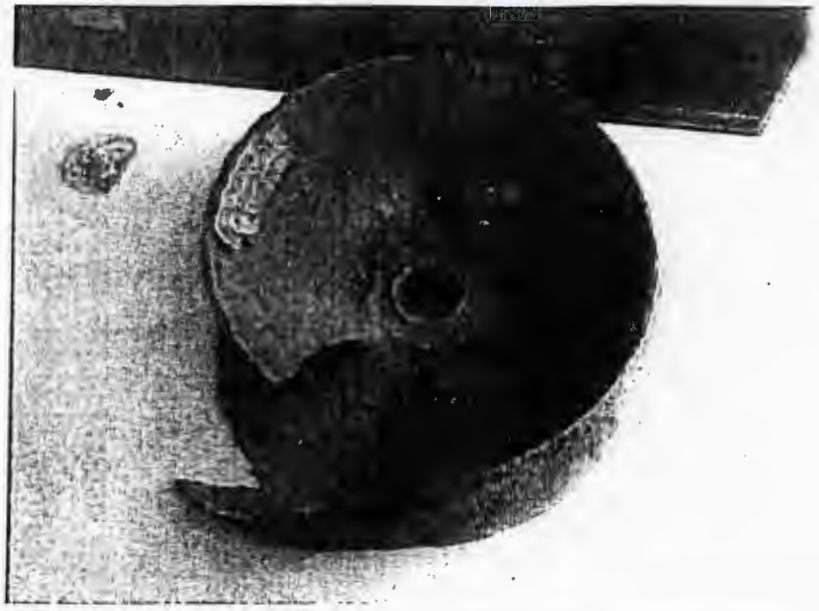


Picture 18 – Influent Pump No. 2 Check Valve Leaking onto Pump Volute

Picture 19 – Existing Circuit Breaker in Influent Pump Station



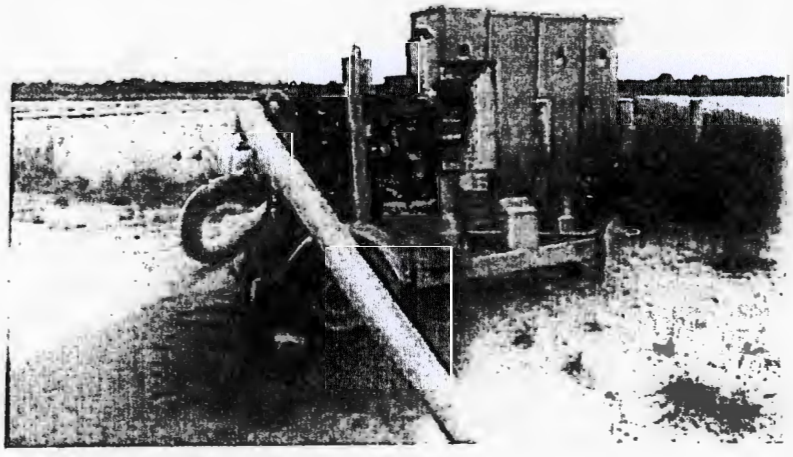
Picture 20 – Influent Pump Station Discharge Piping, Air Release Valve, Magnetic Flow Meter, and Bypass



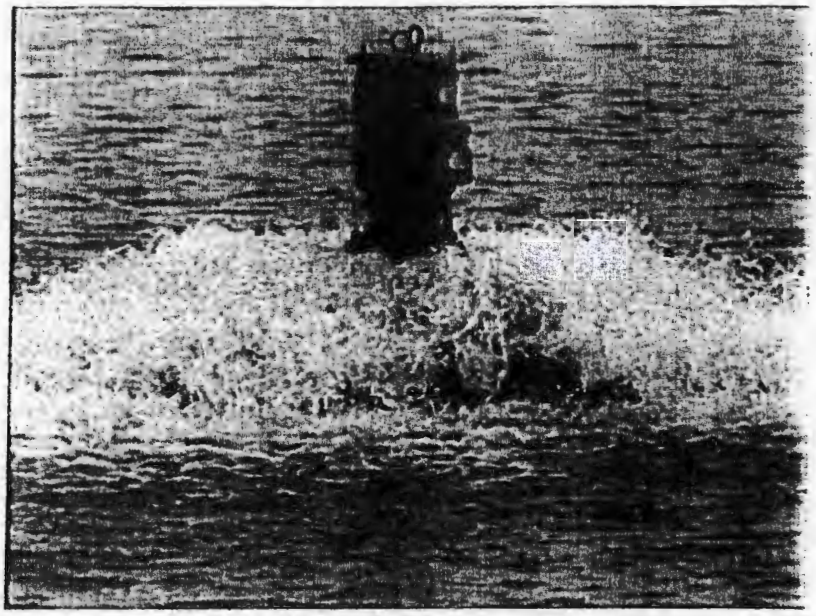
Picture 21 – Corroded Pump Impeller Recently Replaced

Picture 22 – Unpermitted Storage Lagoon

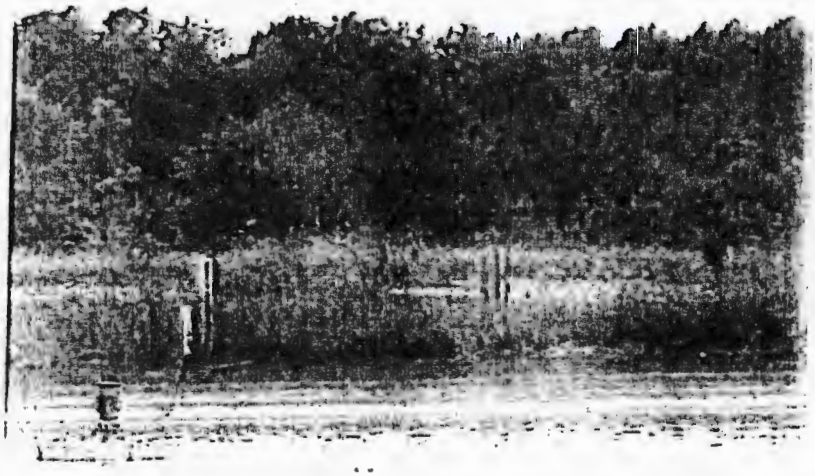
Picture 23 – Filter Bypass Piping



Picture 24 – Filter Bypass Pump



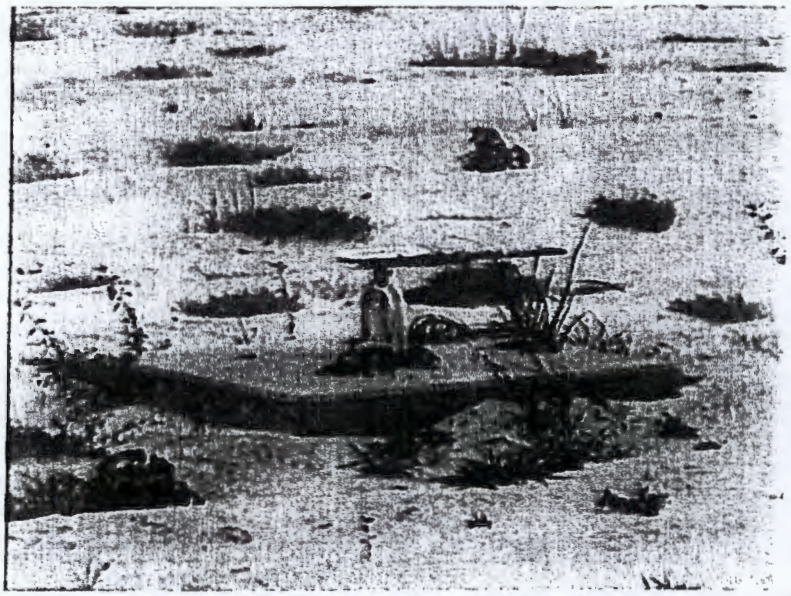
Picture 25 – Surface Aerator Showing Signs of Wear and Tear



Picture 26 - Surface Aerator Out-of-Service in Partial Mix Cell

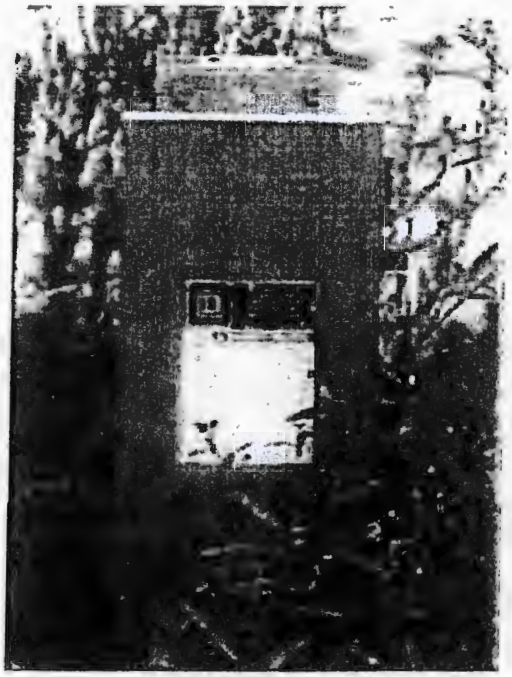
Picture 27 – Partial Mix Cells

Picture 28 – Existing Intermittent Sand Filters with Vegatative Growth

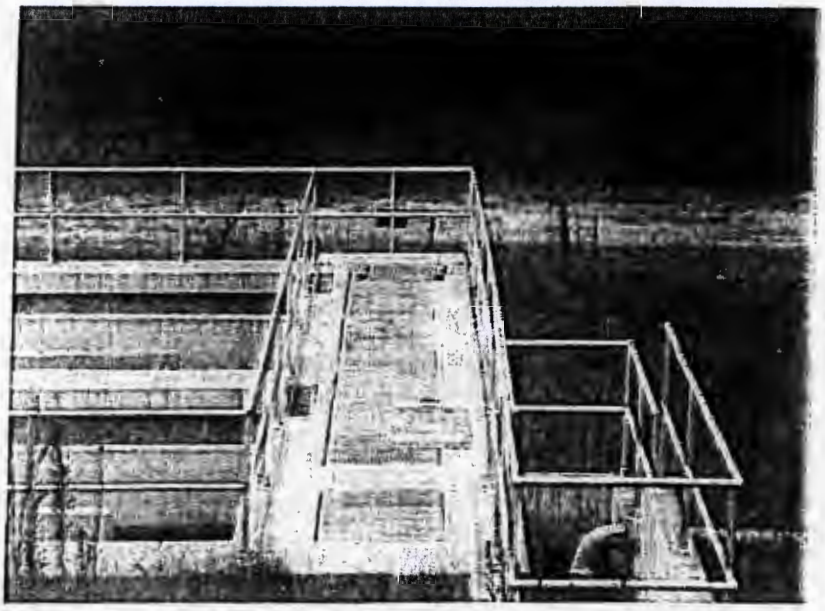


Picture 29 – Intermittent Sand Filter Mud Valve and Concrete Spill Slab

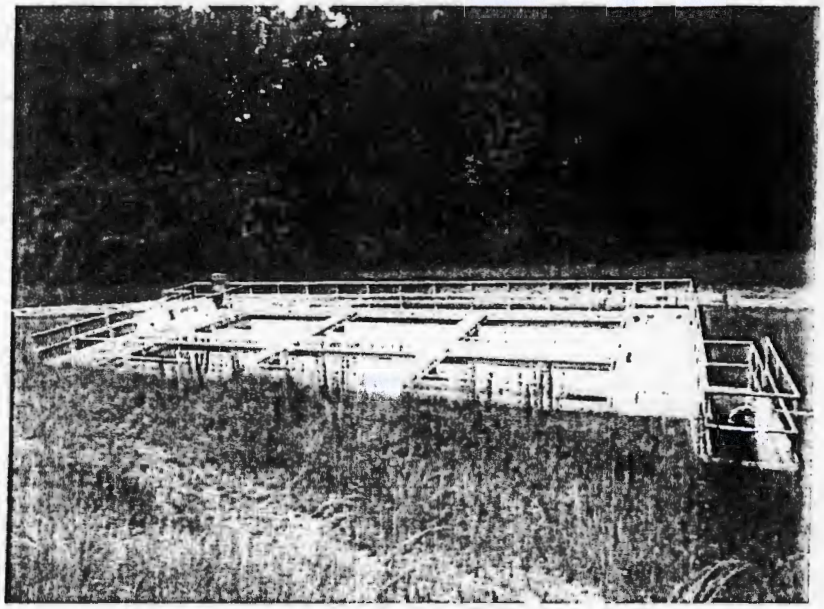
Picture 30 – Ponding on Intermittent Sand Filter Surface



Picture 31 – Filter Isolation Valve Disconnect Switch



Picture 32 – Chlorine Contact Chamber Influent Channel



Picture 33 – Chlorine Contact Chamber

City of Florence

Sewer Overflow Response Plan (SORP)

May 2015

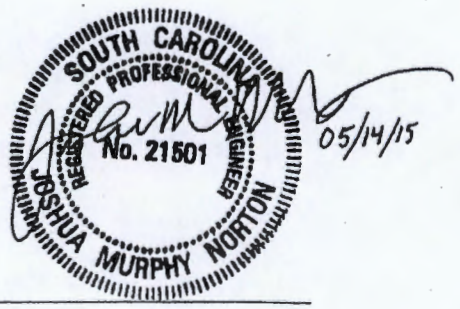
City of Florence

Sewer Overflow Response Plan (SORP)

May 2015

Prepared By:

CDM Smith Inc.



I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Andrew Griffin, City Manager

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1.0 INTRODUCTION

1.1 PURPOSE

The purpose of The City of Florence's (City) Sewer Overflow Response Plan (SORP) is to facilitate a prompt and appropriate response to any sanitary sewer overflow (SSO), release, or diversion of wastewater from or caused by the sanitary sewer system (SSS). Such events may include, but are not limited to, conditions in the City owned collection system such as blockages that have the potential for wastewater backups into buildings, and discharges from the collection system designed to carry wastewater from the service area to the wastewater management facility (WWMF). Discharges may involve manholes, pump stations, transmission lines, collection lines, or other appurtenances.

SSOs can involve large volumes of wastewater and can pose a substantial threat to the receiving surface waters. Additionally, maintenance activities to repair sewer pipes can create excessive sediment that can impact the storm sewer system. This SORP reflects the procedures established for responding to reports of potential and confirmed SSOs, and for minimizing the impacts that SSOs and their related activities could have on the environment, local waterways, and the storm sewer system. Copies of this document will be provided to all persons who are involved in meeting its objectives.

1.2 GENERAL BACKGROUND

The City's Collection Operations Division is responsible for responding to SSOs that occur within the City's sanitary sewer collection system (not including pump stations). The City's Wastewater Treatment Division is responsible for responding to SSOs that occur at the City's WWMF, the Town of Timmonsville's (Town) Wastewater Treatment Plant (WWTP), or any of the pump stations located throughout the SSS.

Potential SSOs are defined as possible but unconfirmed sanitary sewer overflows, while confirmed SSOs are defined as sanitary sewer overflows where physical evidence is present that the SSO has occurred and is from or caused by the SSS. In many situations the Utilities Department or Police Dispatch will receive reports of potential SSOs. The Utilities Department and/or Police Dispatch will be responsible for directing the reports of a potential SSO to the appropriate division (Collection Operations or Wastewater Treatment). Contact information for City staff as well as other entities potentially involved in SSO response, mitigation, and reporting is provided in Appendix P.

In accordance with South Carolina Department of Health and Environmental Control (SCDHEC) requirements, once an SSO has been confirmed, the City submits a written SSO report to SCDHEC for all spills that exceed 500 gallons. In addition and as recommended by SCDHEC, the City Manager's office and/or Utilities Department provide a public notice for all spills that exceed 5,000 gallons or as deemed necessary by the City Manager or SCDHEC to protect the health and safety of the public . Public notices are made in accordance with Section 3.5, Appendix G, and Appendix H.

1.3 DEFINITIONS AND ACRONYMS

This section is designed to define terms and acronyms used in the SORP as defined in the Clean Water Act (CWA) or in regulations promulgated under the CWA. It includes basic definitions of a SSS and SSO, thereby giving readers an overview to help understand the following sections.

1.3.1 DEFINITIONS

1. **Building Backup** – shall mean a SSO in the form of wastewater release or backup into a building or private property that is caused by blockages, flow conditions, or other malfunctions in the SSS. A wastewater backup or release that is caused by blockages, flow conditions, or other malfunctions of a private lateral is not a Building Backup for the purposes of this SORP.

2. **Chronic Overflow Location** – Avoidable overflows that occur at the same location in excess of a frequency as specified by the regulatory authority.

3. **Force Main** – shall mean any pipe that receives and conveys, under pressure, wastewater from the discharge side of a pump. A Force Main is intended to convey wastewater under pressure.

4. **Gravity Sewer Line** – shall mean a pipe that receives, contains, and conveys wastewater not normally under pressure, but is intended to flow unassisted under the influence of gravity. Gravity sewers are typically not intended to flow full under normal operating conditions.

5. **Infiltration** – shall mean water other than wastewater that enters a sewer system (including sewer service connections and foundation drains) from the ground through such means as defective pipes, pipe joints, connections, or manholes.

6. **Inflow** – shall mean water other than wastewater that enters a sewer system (including sewer service connections) from sources such as, but not limited to, roof leaders, cellar drains, yard drains, area drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers, catch basins, cooling towers, storm water, surface runoff, street wash waters, or drainage.

7. **Pump Station** – shall mean facilities comprised of pumps which lift wastewater to a higher hydraulic elevation, including all related electrical, mechanical, and structural systems necessary to the operation of that pump station.

8. **Sanitary Sewer Overflow (SSO)** – shall mean an overflow, spill, diversion, or release of wastewater from or caused by the SSS. This term shall include (i) discharges to waters of the State or United States from the SSS; and (ii) any release of wastewater from the SSS to public or private property that does not reach waters of the United States or State, including Building Backups.

9. **Sanitary Sewer System (SSS)** – shall mean the municipal sanitary wastewater collection and transmission systems, including all pipes, force mains, gravity sewer lines, lift stations, pump stations, manholes and appurtenance thereto conveying wastewater to the WWTP.

10. **Wastewater Management Facility (WWMF)** – shall mean that portion of the City of Florence WWMF designed to provide treatment of municipal sewage and industrial waste and all components of such management facility.

1.3.2 ACRONYMS

1. **BMP** – Best Management Practice
2. **CCTV** – Closed Circuit Television
3. **CWA** – Clean Water Act
4. **DMR** – Discharge Monitoring Report
5. **EPA** – United States Environmental Protection Agency
6. **I/I** – Infiltration and Inflow
7. **MPS-PLE** – Major Pump Station Power Loss Evaluation
8. **MS4** – Municipal Separate Storm Sewer System
9. **NPDES** – National Pollutant Discharge Elimination System
10. **SCDHEC** – South Carolina Department of Health and Environmental Control
11. **SCMIRF** – South Carolina Municipal Insurance and Risk Financing Fund
12. **SOP** – Standard Operating Procedure
13. **SORP** – Sewer Overflow Response Plan
14. **SSO** – Sanitary Sewer Overflow
15. **SSS** – Sanitary Sewer System
16. **WoS** – Waters of the State or United States
17. **WWMF** – Wastewater Management Facility
18. **WWTP** – Wastewater Treatment Plant

1.4 OBJECTIVES

The procedures set forth herein are intended to be a standardized course of action, with good faith intent, and reflect the following objectives:

1. Protect public health and safety;
2. Maintain a high level of customer service;
3. Protect private and public property adjacent to the collection and treatment facilities;
4. Protect wastewater treatment and collection system personnel;
5. Protect the collection system, wastewater pumping stations, wastewater treatment facilities, and all appurtenances;
6. Minimize adverse water quality, stormwater, and other environmental impacts;
7. Comply with all local, state, and federal rules and regulations;
8. Avoid NPDES permit violations; and,
9. Minimize liability.

1.5 DISTRIBUTION AND MAINTENANCE

1.5.1 SUBMITTAL AND AVAILABLILTY

The Utilities Director or his/her designee will distribute copies of this SORP and any amendments here to the following:

1. City Manager
2. City Engineer
3. Engineering Department Superintendent
4. Collection Operations Division Manager
5. WWMF Superintendent
6. Compliance Superintendent
7. Police Department Dispatch Operator

It shall be the responsibility of the appropriate superintendent or manager to ensure that any other personnel who may become involved in responding to a potential SSO have a copy of the SORP and are familiar with its contents. This includes foremen and crews doing the actual work in the field. An electronic copy of the SORP may be made available to others upon request.

1.5.2 REVIEW AND UPDATE OF SORP

This SORP will be reviewed and amended as appropriate. The Utilities Director or his/her designee shall conduct an annual review of the SORP and will update the SORP as needed to reflect any necessary changes. The Utilities Director or his/her designee will provide an updated copy of the SORP to staff noted above in Section 1.5.1.

1.5.3 TRAINING

The Utilities Director or his/her designee will train appropriate personnel, including contractors and personnel of contractors, on the use of the SORP and any updates thereto. Continuing education training will be repeated annually or whenever changes are made to the SORP. Training will also cover storm water protection techniques and Best Management Practices (BMPs) use/selection for each crew. This training may be combined with other staff training initiatives.

This SORP is a living document and should be regularly updated to ensure a timely and appropriate response to all wastewater related SSOs. The SORP will be used as the training guide and the training will focus on:

1. SSO Emergency Response Plan Procedures;
2. SSO Emergency Response Plan Objectives;
3. Call Taking and Dispatch of Appropriate Crews;
4. Site Assessment, SSO Correction, Containment and Clean Up;
5. Public Advisory Procedures, Temporary Signage, and Media Notification;
6. Downstream Drinking Water Sources Notification;
7. Regulatory Agency Notification;
8. Safety Procedures; and
9. Documentation, Data Collection, Volume Calculations and Record Keeping.

This SORP is intended to be a short-term, proactive approach to managing potential or confirmed SSOs and their immediate effects. The SORP is an integral component of a broader watershed approach to controlling SSOs.

2.0 OVERFLOW FIRST RESPONDERS

2.1 COLLECTION OPERATIONS DIVISION

The City's Collection Operations Division is responsible for maintaining approximately 513 miles of sanitary sewer pipes in the City's service area as well as 26 miles of sanitary sewer pipes in the Town's service area. Objectives of the Collection Operations Division include:

1. Quality service to customers;
2. Management of infrastructure assets, including sewage collection;
3. Utilization of sound best management practices;
4. Minimize adverse water quality, stormwater, and other environmental impacts; and
5. Regulatory compliance.

The City will operate and maintain all components of the sanitary sewer system (SSS) in a fashion that will minimize the potential for SSOs. The City places emphasis on programs and training of qualified personnel who are expected to be professional and proactive. Despite best efforts, and due to unforeseeable events such as improper flushing of materials and catastrophic weather conditions, all SSOs may not be eliminated. The procedures contained in Section 3.0 will be implemented by staff of the Collection Operations Division when SSOs occur.

2.2 WASTEWATER TREATMENT DIVISION

The City's Wastewater Treatment Division is responsible for operating and maintaining 102 pump stations in the City's service area as well as 15 pump stations in the Town's service area. The Division also operates the City's 22 million gallons per day (MGD) WWMF as well as the Town's 2 MGD WWTP. Objectives of the Wastewater Treatment Division include:

1. Quality service to customers;
2. Management of infrastructure assets, including wastewater treatment and pump stations;
3. Utilization of sound best management practices;
4. Minimize adverse water quality, stormwater, and other environmental impacts; and
5. Regulatory compliance.

The City will operate and maintain all components of the City's WWMF, the Town's WWTP, and sanitary sewer pump stations in a fashion that will minimize the potential for SSOs. The City places emphasis on programs and training of qualified personnel who are expected to be professional and proactive. Despite best efforts, and due to unforeseeable events such as

improper flushing of materials and catastrophic weather conditions, all SSOs may not be eliminated. The procedures contained in Section 3.0 will be implemented by staff of the Wastewater Treatment Division when SSOs occur.

Additionally, as a regulated Municipal Separate Storm Sewer System (MS4), the City also holds a stormwater National Pollutant Discharge Elimination System (NPDES) permit issued by SCDHEC. This permit requires the City have controls in place to detect and eliminate sanitary sewer discharges into the MS4.

3.0 OVERFLOW EMERGENCY RESPONSE PLAN

3.1 DETECTION AND RECEIPT OF INFORMATION

Potential SSOs and/or Potential Building Backups are generally reported and treated in the manner as outlined herein. The proper dispatcher protocol is also provided in Appendix A.

1. During normal business hours, the Utilities Department switchboard operator will receive notification from the general public, law enforcement, or other city personnel. For calls after normal business hours, on holidays, and weekends, all calls are transferred to the City's Police Dispatch operator;

2. The call taker will seek to get enough information from the caller to determine if a potential SSO involves the storm drain system, drinking water system or wastewater system;

3. During normal business hours the Utilities Department switchboard operator is responsible for entering the date, time, and other pertinent information into the City's Munis work order system. When receiving an after-hours, holiday, or weekend call, the Police Dispatch operator will dispatch an on-call utility crew;

4. The Collection Operations Division crew team leader or Wastewater Treatment Division shift supervisor will receive the work order or dispatch; and

5. The Police Dispatch operator will also fax a copy of the after-hours, holiday, or weekend call log to the Utilities Department the next business day. The Utilities Department switchboard operator will enter the call log data into the Munis work order system.

Call takers shall attempt to record relevant information known by the caller regarding the potential SSO, including:

1. Time and date the call was received and the person who received the call;

2. Specific location of the potential SSO;

3. Time the potential SSO was noticed by the caller;

4. Caller's name and phone number(s), and how best to contact for follow up;

5. Information concerning specifics supplied by the caller (i.e., odor, duration, in street, back or front of property);

6. Whether or not a potential SSO has reached or is flowing toward a creek, stream or river, a park, playground, school yard, or other public use location; and

7. Other relevant information which will allow the responding crew to quickly locate, assess, and alleviate the potential SSO.

3.2 DISPATCH OF APPROPRIATE CREWS

The purpose of an immediate response to a potential SSO is to identify and correct any problems that could cause or have caused an SSO. If more than one potential SSO occurs at or near the same time period, different crews will be sent to address the different potential SSOs, when possible. If this is not possible, the potential SSOs will be prioritized by the Collection Operations Division Manager, WWMF Superintendent, or his/her designee upon receipt of the work orders and/or dispatches. The potential SSOs will be prioritized in order of greatest threat to public health, surface waters and property.

Water quality sampling will be conducted in accordance with Section 3.4.5 when evidence exists that the SSO has reached "Waters of the United States" (See Appendix B, #4 for a definition of "Waters of the United States") or as directed by SCDHEC. In such case, SCDHEC may determine the parameters to sample for and at what locations. Depending on the nature of the spill, the City may take samples concurrently with SCDHEC.

During wet weather events, the Collection Operations Division Manager or his/her designee will have appropriate City staff inspect collection system locations that are identified as Chronic Overflow Locations as listed in Appendix L. Wastewater Treatment Division personnel will remotely monitor the Middle Swamp, Police Cabin, Steel Road, and Williamson Road pump stations for normal operation and any increase in flow per the procedures established in the City's Major Pump Station Power Loss Evaluation (MPS-PLE). The four pump stations listed are large interceptor pump stations that direct wastewater flow to the WWMF. Any changes in the operation of these four pump stations, including the potential need for bypass pumping to prevent the exceedance of the pump station's flow and storage capacity, will be communicated to the Collection Operations Division Manager to allow for collection system monitoring as well as the WWMF Superintendent in order to allow for operational adjustments at the WWMF.

3.3 OVERFLOW MITIGATION

Once a potential SSO is confirmed by the responding crew, the crew will reduce potential negative impacts on the environment and hazards to public health by employing all reasonable containment activities during discharge events. Under most circumstances the Collection Operations Division or Wastewater Treatment Division will have personnel and equipment that will be able to correct, contain, and clean up SSO related impacts. A list of equipment required to properly address most SSOs and Pump Station Failures is provided in Appendix Q. Emergency procedures related to Pump Station Failures due to power loss are also provided in the City's MPS-PLE.

A situation may arise that will require the support of an outside contractor. A list of emergency contractors, including contact information, is maintained by the Utilities Department and is provided in Appendix M. Contractor services will be obtained through the City's Emergency Procurement Procedure as outlined in Appendix N. Examples may include repair to sewer pipe

in remote areas, creek crossings, or large diameter pipe buried deeply where extensive shoring may be required to resolve the SSO. In these cases, interim measures are taken to contain the SSO and prevent any additional harm to the environment, private property, public health, etc. Contractors are responsible for the same level of environmental stewardship as City crews, and requirements for appropriate stormwater Best Management Practices (BMPs) (such as inlet protection, debris cleanup, etc.) will be provided to contractors before any work begins.

3.3.1 SITE ASSESSMENT

All Collection Operations Division or Wastewater Treatment Division personnel responding to a potential SSO will adhere to the following planned actions:

1. It is the responsibility of the first responder who arrives at the site of a potential SSO to protect the health and safety of the public;

2. First responder performs an initial evaluation at the site, identifies the impacted area, develops a plan of remedial action, and identifies the personnel, equipment, and materials required to remediate the SSO;

3. If the first responder requires assistance in determining the cause of the SSO, then the appropriate supervisor will be notified immediately. The supervisor will be responsible for employing appropriate measures (i.e. Closed Circuit Television (CCTV), smoke testing, etc.) to determine the cause(s) of the SSO;

4. The health and safety of the public and City personnel are of primary concern. Responding crew members will contact their supervisor whenever a suspicious substance (i.e., oil sheen, foamy residue) is found on the ground surface, within surface waters or ponded areas, or upon detection of a suspicious odor (i.e., gasoline, chemical), not common to the sewer system. City staff must be trained in safe handling of sanitary sewer overflows and follow universal precautions for raw sewage and blood borne pathogens;

5. The proper regulatory agency will be notified by the Utilities Director or his/her designee within 24-hours if the first responder notices any overflows (i.e. non-rainwater discharges) entering a body of water or a storm drain;

6. Notify the Office of the City Manager immediately for public notification guidance when calculations, as initially estimated by the responding crew and confirmed by the Utilities Director, City Engineer, or his/her designee, determine the overflow to be 5,000 gallons or more, or when there is a reasonable possibility that there may be human contact with the contaminated receiving water prior to dilution by a factor of one million;

7. Due to the emergency nature of most wastewater activities, it is understood that stopping or unstopping the flow is the major concern of the personnel onsite. As early as is feasible (but always before any digging activity), a member of the

responding crew will deploy inlet protection devices in the immediate downstream area of the primary event location. Any storm drains, conveyance channels, or sensitive areas (wetlands, adjacent waters, etc.) will be protected, when feasible, with sandbags, gravel bags, sediment tubes, or a combination of the three BMPs. This equipment is located at the Public Works Lot and is accessible via keyed entry to all City employees. These inlet protection measures should stay in place until the maintenance activity has been completed, thus reducing the sediment and pollutant impact. In some cases, the bags or tubes can be rinsed out over a vegetated area and reused;

8. The appropriate Fire Department Hazardous Material Response Team (HAZ-MAT) shall be notified by calling the Fire Department phone number provided in Appendix P if hazardous material is suspected to be present in the SSO; and

9. Associated personnel will assist, as necessary, to ensure that all potential SSOs are addressed in a timely manner. On-call personnel, supervisors, and Utilities Department staff will communicate and coordinate activities and transfer pertinent information to the next shift at shift change, including details of the problem and observations described by the person who reported the problem.

3.3.2 OVERFLOW CORRECTION AND CONTAINMENT

Containing spills is the concept of establishing a physical barrier to control the further dispersal of sewage, thus reducing the impact on downstream areas such as private property and streams. Containment procedures will vary on a case-by-case situation. Such measures are specifically designed to ensure that the proposed plan of action will meet the goals of the SORP.

Upon arrival at a potential SSO, (i.e., sewer line blockage, sewer line break, pump station malfunction) and with the crew team leader or shift supervisor serving as the responsible party, the first responding personnel will:

1. Request assistance as needed to determine the cause and contain the SSO;

2. Determine where the SSO has occurred and determine the immediate destination of the SSO (i.e., storm drain, surface water, ground surface, and so on);

3. Begin to secure the work area and request personnel, materials, and equipment as required to expedite containment and/or mitigation of the SSO;

4. Coordinate with Wastewater Treatment Division personnel to turn off pump stations, as appropriate, to minimize or eliminate the SSO during any repair work;

5. Determine whether flow diversion techniques are practicable;

   When possible, flow diversion techniques provide an effective means of conveying the overflow back into the sewer system. This procedure reduces additional potential

impact on the immediate area and the possible impact downstream. The flow diversion techniques employed by the City when practicable include, but are not limited to, the following:

- Bypassing measures - Portable bypass pumps can be used in certain situations to collect overflowed sewage from the environment and convey it back into the sanitary sewer system beyond the disruption of service. This method is most effective in bypassing a single identified problem area, including gravity sewer or pump station locations, when the overflow can be directed to the next downstream manhole or force main connection point. It is typically not appropriate in wet weather overflows. This type of equipment can be used in conjunction with other containment measures or may be used independently. Additionally, the Utilities Department shall maintain a list of qualified contractors capable of providing emergency bypass pumping as may be required.

- Vactor/Combination cleaner/flusher procedures - Combination cleaner/flusher equipment provides an additional resource for collecting overflowed sewage and conveying it back into the sanitary sewer system beyond the disruption of service. This equipment can be used in certain situations in conjunction with other containment measures or may be used independently. Like portable bypass pumps, this equipment may not be effective in wet weather situations.

6. Determine mitigation/remediation solutions;

The timely use of flow restrictions is the most effective instrument to reduce additional negative impact on the environment. Also, this phase of field activities may enable restoration of service to City wastewater customers.

The type of mitigation and remediation will vary depending on the cause of the SSO. Wet weather SSOs are often caused by inflow and infiltration (I/I) in conjunction with blockages or other problems in the system. Mitigation of wet weather overflows may not be possible until the overflow subsides, but when it does, the City will implement all necessary steps to clean up and disinfect the overflow site.

When the SSO is due entirely to wet weather flow, efforts are made to minimize the impact of the SSO. The location is monitored until the SSO ends. For the duration of the SSO, solids are continually cleaned up, and lime is used for disinfection. Bacteriological testing in accordance with Section 3.4.5 is carried out to assess the impact of the SSO on a receiving water, if necessary.

Dry weather events may be addressed using several methods, including visual inspection, flush water from a wash truck, and CCTV inspection. The field professionals may identify the most effective method or combination of methods available for use to return service to the system. Field crews should use CCTV inspection to determine the most effective way to resolve any service disruption.

CCTV inspection may help to identify the cause and location of the blockage and the necessary techniques needed to eliminate it.

7. Deploy inlet protection in the immediate area of the primary event location. Any storm drains, conveyance channels or sensitive areas (wetlands, adjacent waters, etc.) will be protected with sandbags, gravel bags, sediment tubes, or a combination of the three BMPs. See Appendix J for additional stormwater BMP guidelines;

8. Control pedestrian and vehicular traffic, as needed, using flagmen, barricades, warning tape, fencing, signage, etc.;

9. Employ universal safety precautions during corrective and containment activities;

10. Provide an initial estimate of the volume of untreated wastewater released by a SSO. See Appendix E for overflow volume estimation procedures; and

11. Document the estimated start time, time of completion, personnel involved, and the cause of the SSO.

12. Notify the Collection Operations Division Manager or WWMF Superintendent, as appropriate, as well as the Utilities Director in order to allow for a final assessment once the SSO has been contained.

The primary objective of the first responder(s) is to correct the immediate cause of all SSOs. Personnel on the scene will also determine if the SSO is going into Waters of the State (WoS). If private property is involved, the responding personnel will use discretion in providing assistance to a private property owner/occupant who may have sustained property damage. A responding crew should not enter private property for the purpose of assessing damage unless directed otherwise by a supervisor. If the SSO has entered WoS, the Utilities Director or his/her designee will notify the proper regulatory agency.

The Collection Operations Division Manager, WWMF Superintendent, or his/her designee will assist the first responder and visit the site of the SSO as needed to ensure that all of the provisions of this SORP and other directives are met. The Utilities Director will initiate regulatory reporting procedures in accordance with Section 3.4, while the City Manager, Utilities Director, or his/her designees are responsible for initiating public notification procedures in accordance with Section 3.5.

Should the cause of the SSO not be related to infrastructure owned by the City (i.e., an overflowing private sanitary sewer), but there is imminent danger to public health, public or private property or to WoS, then prudent emergency action shall be taken until the responsible party assumes responsibility.

The Utilities Director or his/her designee will notify SCDHEC of all identified SSOs not related to infrastructure owned by the City. SSOs from private laterals, into basements, etc. which are

alleged to be the result of problems in the wastewater collection system will be addressed by Collection Operations Division personnel on a case by case basis.

3.3.3 OVERFLOW CLEAN UP

For all SSOs, the clean-up methods to be used by the responding crew will strive to meet the criteria established in Section 1.4 - Objectives. Planned actions for clean-up include:

1. The SSO area will be secured to prevent contact by the public during the cleaning process. Signage and notice requirements, as deemed necessary to prevent such contact, will be implemented as provided in Section 3.5 below;

2. All storm drains or storm sewer conveyance structures within the immediate downstream area of the SSO will be protected from entry by wastewater using sand or gravel bags, sediment tubes, or a combination of the three items. These BMPs are put into place to prevent sediment and other solids from entering the storm sewer system;

3. All readily identifiable residues (i.e., fecal matter, sludge, rags, papers, or plastics) will be removed;

4. Cleanup activities will utilize universal safety precautions;

5. Where practical in locations where flush water will not flow to WoS, the SSO area will be flushed with wash down water. The wash down water will be contained with constructed containment dikes to the maximum extent possible and will be properly disposed of;

6. If the SSO is to dry land only and flushing causes the SSO and/or flush water to inadvertently reach WoS the incident will be reported as a SSO to WoS;

7. Solids and other debris will be flushed, swept, raked, picked up and transported to proper disposal sites;

8. Standing water that has collected as a result of the SSO will be pumped and returned to the sewage system. Solids and associated wastewater debris remaining after the area has been pumped will be flushed, raked, picked up, removed from the site, and properly disposed of;

9. Contaminated soil will be treated with lime or High-Test Hypochlorite (HTH) in accordance with product label and Safety Data Sheet instructions. See Appendix F for disinfectant handling instructions;

10. Any sediment or soil that remains on an impervious surface (street, parking lot, etc.) must be removed to the maximum extent practical. The area shall not be hosed down to remove sediment (unless it is necessary for traffic safety). Crews should use

backhoes (for large amounts) and shovels and brooms to remove excess sediment that could wash into storm drains;

11. After all digging and cleanup activities have finished, the inlet protection BMPs may be removed. If planning to re-use the bags or sediment tubes, they should be rinsed out over a pervious surface or vegetated area. The bags should not be rinsed out over a storm drain, water body or ditch, or impervious surface (such as a street). If bags or tubes have been saturated with sanitary debris or solids, they should be disposed of properly to the sanitary landfill;

12. When activities are complete, the flow path of the discharge will be inspected. Any areas that may have experienced soil erosion and need repair will be identified. Erosion control blankets, mulch or geo-fabric with hay matting (which can include seeds) will be used to stabilize soil erosion. Always make every attempt to re-establish vegetation on the impacted area, and if necessary continue inspections until the area has stabilized. Contact the Compliance Section with any questions or help with ongoing inspections or stabilization issues; and

13. When a Building Backup is reported to the Utilities Department, response to the report should be a priority of the department in order to minimize potential damage. Collection Operations Division personnel will respond to Building Backups to determine the location of the backup, but do not perform cleanup functions inside privately owned buildings. Responding personnel shall recommend that the customer arrange for cleanup as soon as possible to prevent further damage. If the backup is determined to be caused by the City's sewer system, the customer will be referred to the City's Risk Management Division to file a claim report. Additional details regarding the general operating procedures for a citizen to file a claim against the City for a sewer backup incident in provided in Appendix K.

3.4 REGULATORY REPORTING

3.4.1 DATA COLLECTION

If a potential SSO is confirmed to be an SSO:

1. The individual(s) responding to the SSO will report findings, to include the confirmed location of the SSO, estimated SSO start time, and the cause of the SSO, to the Utilities Director or his/her designee. These notes will become a part of the initial 24-Hour report to be provided to SCDHEC;

2. The responding crew will provide an initial estimate of the volume of untreated wastewater released by the SSO through use of the overflow volume estimation procedures provided in Appendix E;

3. The Utilities Director or his/her designee will ensure the procedures noted in this document are completed; and

4. The Collection Operations Division Manager, WWMF Superintendent, or his/her designee will document immediate actions taken to mitigate the SSO and the steps taken to prevent recurrence. These notes will become a part of the final 5-Day Written Report filed for the record and used for notification purposes.

If a potential SSO is reported and no SSO is confirmed, the responding personnel shall contact the Collection Operations Division Manager, WWMF Superintendent, or his/her designee and ensure the proper address or location was received. Once the information is verified to be correct the Collection Operations Division Manager, WWMF Superintendent, or his/her designee will document and have a report on file of the incident.

3.4.2 24-HOUR REPORT

The Utilities Director or his/her designee will contact the SCDHEC Pee Dee Region EQC Office in Florence within 24 hours of confirming an SSO of 500 gallons or more. This contact will be by telephone at 843-661-4825 during normal business hours and after-hours reporting shall be made to SCDHEC's 24-hour Emergency Response number at 888-481-0125.

The 24 Hour Report will include, at a minimum, the following information (see Appendix B for additional information regarding the 24-Hour Report):

1. Identification of the utility name, person reporting the SSO, and a contact number;
2. Date and start time of the SSO;
3. Location of the SSO by street address or other appropriate method; and
4. Whether the confirmed SSO is reaching WoS (include the name of the receiving stream or water body).
5. Details of any bacteriological sampling performed by City staff if the SSO is reaching WoS.

3.4.3 5-DAY WRITTEN REPORT

In addition to the 24-Hour Report, the Utilities Director or his/her designee will prepare and submit a written report of the SSO, in accordance with procedures outlined in Section 3.4.4, to SCDHEC for all SSOs that exceed 500 gallons. This report will be submitted to SCDHEC within five (5) days of the confirmation of the SSO (5-Day Written Report). Standard SCDHEC Sewer System Overflow or Pump Station Failure Report Form (02/2000), as provided in Appendix C, is used for the 5-Day Written Report and will include, at minimum, the following information:

1. Permittee name, number, and county;
2. Start date and time of the SSO event;

3. Date and time of initial SCDHEC notification as well as SCDHEC contact name;
4. Description of the source, e.g., manhole cover, pump station;
5. Location of the SSO by street address or other appropriate method;
6. Cause of the SSO;
7. Control actions taken to mitigate the SSO;
8. Corrective actions taken to eliminate future discharges;
9. Duration and volume (estimate if unknown) of the SSO;
10. The ultimate destination of the flow; e.g., surface water body, land use location via municipal separate storm sewer system to a surface water body (include the name of the receiving stream or water body);
11. Information regarding the notification of any downstream in-takes;
12. Date and time of corrective and clean up actions taken;
13. Description of the cleanup process used following containment of the SSO;
14. Identification of the person providing the 5-Day Written Report concerning the SSO; and
15. Reason why the required 24-Hour Report was not provided in a timely manner, if applicable.

The 5-Day Written Report will be provided to SCDHEC's Pee Dee Region EQC Office as well as SCDHEC's Bureau of Water Office in Columbia. The report shall include the signature of the Utilities Director or his/her designee.

If the SSO is still ongoing at the time the 5-Day Written Report is due, the Utilities Director or his/her designee will contact the SCDHEC Pee Dee Region EQC Office in Florence and provide an update to the appropriate SCDHEC staff. Once the SSO has ceased, the Utilities Director or his/her designee will submit the 5-Day Written Report in accordance with the guidelines provided above.

3.4.4 PROCESSING ALL SANITARY SEWER OVERFLOW REPORTS

Once the form is complete, the hard copy report form will be scanned, saved, and emailed or faxed to SCDHEC within five (5) days of the overflow. A listing of recent SSOs greater than 500 gallons may be accessed through the SCDHEC website.

The original hard copy report as well as an electronic copy will be saved in the Utilities Department file folder and maintained for at least three (3) years. Work order records associated with the investigation and repair activities and complaints from customers or others regarding SSOs will be maintained within the City's Munis work order system for at least three (3) years.

A copy of the report shall also be forwarded to the appropriate City personnel for Discharge Monitoring Report (DMR) reporting in accordance with the City's NPDES permit. See Appendix D for DMR requirements.

3.4.5 BACTERIOLOGICAL SAMPLING

If wastewater reaches WoS as the result of an SSO, the Utilities Director or his/her designee will notify a designated sampler from the City's Compliance Section of the need to perform bacteriological sampling during and/or following the SSO event. Samples will be taken in accordance with the protocols established by the City's approved laboratory Standard Operating Procedure (SOP) for Fecal Coliform, as shown in Appendix O, and the following procedures:

1. Determine where the SSO impacted the waterway;
2. Where available, utilize GIS mapping to determine if the site can be sampled above impacted area to determine waterway background levels;
3. Where possible, determine sampling location above impacted area, at impacted site, and downstream of impacted area;
4. Ice down cooler, prep sampling equipment and sample bottle utilizing proper chain of custody techniques;
5. When entering potentially hazardous areas utilize the buddy system;
6. Use proper PPE and safe collection practices;
7. Per approved laboratory protocol, collect sample(s) at each location and make field notes. Record date, time, exact location of sample sites, sampler personnel information, and project name. Samples will be recorded by SSO location;
8. Deliver samples to lab for analysis within six hours of collection; and
9. Repeat sampling every 24-hours until the fecal coliform colonies count is less than 8,000 or as directed by SCDHEC. Multiple days may be necessary. Inform SCDHEC of results as soon as they are available so a determination can be made as quickly as possible regarding the need for additional samples.

3.5 PUBLIC NOTIFICATION PROCEDURE

The City Manager, Utilities Director, and his/her designees are responsible for advising the public of confirmed SSOs of 5,000 gallons or more or as deemed necessary by the City Manager or SCDHEC to protect the health and safety of the public. Posting and notification will differ depending upon the location and severity of the SSO.

3.5.1 TEMPORARY SIGNAGE

The Collection Operations Division Manager, WWMF Superintendent, or his/her designee is responsible for posting signs advising the public of a confirmed SSO as determined to be necessary pursuant to the guidelines set forth in Appendix G herein. The placement of signage is to be determined according to the following criteria related to the location and nature of the confirmed SSO:

1. Signs should be posted at the location of a confirmed SSO which is believed to have entered WoS, at any public access areas downstream of the SSO which may be potentially impacted by a confirmed SSO, and at the location of a confirmed SSO where cleanup and sanitizing of the site has not been completed;

2. Signs should be posted in the vicinity of a confirmed SSO where people are known to be present or where it is obvious that people frequently visit the area (i.e., paths, trails, walkways, and so on) to alert the public to avoid the site and avoid contact with water in the general area. Signs should be posted within twenty-four hours of the initial arrival onsite and confirmation of the SSO condition in order to alert the public; and

3. Temporary signage (i.e., door hangers, yard signs, and so on) may be used where posting at the location of the confirmed SSO is difficult or thought to be ineffective. This method will also be utilized for overflows that are localized and isolated as deemed appropriate in heavily populated areas.

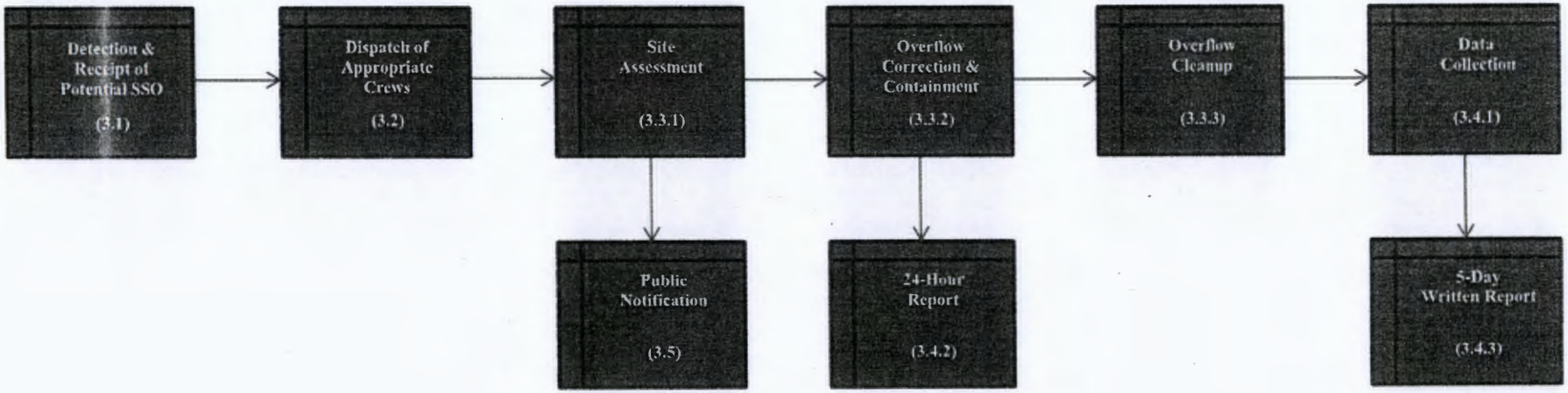
3.5.2 MEDIA NOTIFICATION

The City Manager, Utilities Director, or his/her designee will be responsible for notifying local print and broadcast media via email of an SSO in accordance with the templates provided in Appendix H. The templates provided include the format to be used during an active SSO situation as well as following the containment of an SSO. In addition to local media, the press release shall be distributed to SCDHEC, appropriate City Departments and Divisions, local MS4 permit holders, and local stakeholders. A list of press release recipients is maintained and updated within the Office of the City Manager and the Utilities Department and is provided in Appendix I.

3.5.3 DOWNSTREAM DRINKING WATER INTAKES

The Collection Operations Division Manager or his/her designee will immediately notify downstream public drinking water sources of SSOs that have the potential of flowing, being washed into, or otherwise have the potential of entering downstream water sources. Sources located within ten (10) miles of any SSO of at least 5,000 gallons and within twenty-five (25) miles of any SSO of at least 250,000 gallons will be notified. If a potential SSO is not subsequently confirmed, yet the SSO is in close proximity to a drinking water intake, the downstream sources will still be notified. The 24-Hour Report will include the location of the SSO as well as the watershed potentially affected by the SSO. The SSO location and watershed information indicated in the 24-Hour Report will generally be used to identify the drinking water sources to be notified.

APPENDIX A: DISPATCHER PLAN PROTOCOL



APPENDIX B: 24-HOUR REPORT CHECKLIST

The 24-Hour Report left on voice mail will include, at a minimum, the following information:

1. Identification of the utility name, person reporting the SSO, and a contact number;
2. Date and start time of the SSO failure;
3. Location of the SSO by street address or other appropriate method;
4. Whether the SSO is reaching WoS (include the name of the receiving stream or water body) as well as the details of any bacteriological sampling performed by City staff if the SSO is reaching WoS. According to the United States Environmental Protection Agency 40 CFR 230.3, "Waters of the United States" are defined as:
   a. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
   b. All interstate waters including interstate wetlands;
   c. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
      (i) Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
      (ii) From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
      (iii) Which are used or could be used for industrial purposes by industries in interstate commerce;
   d. All impoundments of waters otherwise defined as waters of the United States under this definition;
   e. Tributaries of waters identified in paragraphs (s) (1) through (4) of this section;
   f. The territorial sea;
   g. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (s) (1) through (6) of this section; waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition) are not waters of the United States.

APPENDIX C: 5-DAY WRITTEN REPORT

SCDHEC Sewer System Overflow or Pump Station Failure Report Form (02/2000)

D H E C

PROMOTE PROTECT PROSPER

South Carolina Department of Health and Environmental Control

Sewer System Overflow or Pump Station Failure Report Form

Please submit this form to the SCDHEC Bureau of Water, Compliance Assurance Division 2600 Bull St. Columbia, SC 29201
Form must be MAILED and/or FAXED to 803.898.4215
A copy of the form should be sent to the local EQC District Office

Permittee:_____ Permit No:_____ County:_____
(If yours is a Collection System not owned or operated by a POTW, please include the name of the receiving POTW)

Date SSO/Failure: _____ Time: _____ (Military Format)

Date DHEC notified: _____ Time: _____

Name of person contacted at DHEC: _____

Description of Source (manhole, pump station, etc.): _____ Pump Station No.:_____
(Include any code or number used to identify pump stations)

Location of SSO/Failure: _____
(Street address or other appropriate description; include map if available)

Cause of SSO/Failure: _____
(Include any related weather information)

_____

Control action taken: _____

_____

Describe corrective action taken: _____

_____

Estimated volume of wastewater released:_____

Did wastewater enter a stream or body of water? Yes No (Circle One)
(If discharge reaches any water already present in a conveyance, ditch, etc. it is considered to have reached waters of the State)

If Yes, Where? _____
(Show location on USGS map or copy thereof, include name of water body)

Were down stream water in-takes notified? Yes No N/A (Circle one) If Yes, Who? _____

Date corrective action completed: _____ Time: _____ (Military Format)

Date clean up action taken: _____ Time: _____

Describe what was actually done in the clean up process? _____

_____

_____

_____ Phone #:_____ Date: _____
Name/Signature of Person Initiating Action

_____ Date: _____
Signature/Sewer System Owner or other Responsible Individual

DHEC 3685 (02/2000)

APPENDIX D: DISCHARGE MONITORING REPORT REQUIREMENTS

SUMMARY REPORT SUBMITTED WITH THE SCHEDULED DMR FORM

In addition to the 24-Hour Report and 5-Day Written Report, the City of Florence WWMF NPDES permit (#SC0045462) also requires the City to submit, along with the scheduled Discharge Monitoring Report (DMR) Form, the following information for each SSO greater than 500 gallons in volume that occurs within the City's service area during the DMR reporting period:

1. Duration and volume (estimate if unknown) of the SSO;
2. Location of the SSO by street address or other appropriate method;
3. Cause of the SSO;
4. Description of the source, (e.g., manhole cover, pump station);
5. Exact dates and times of the SSO event, (i.e., start and stop dates and times);
6. The ultimate destination of the flow; (e.g., surface water body), and name of receiving water;
7. Corrective actions or plans to eliminate future discharges; and
8. Identification of the person providing the written report concerning the SSO.

The summary report submitted with the DMR shall contain all overflow volumes and a copy of each of the SCDHEC Sewer System Overflow or Pump Station Failure Report Forms from the DMR reporting period.

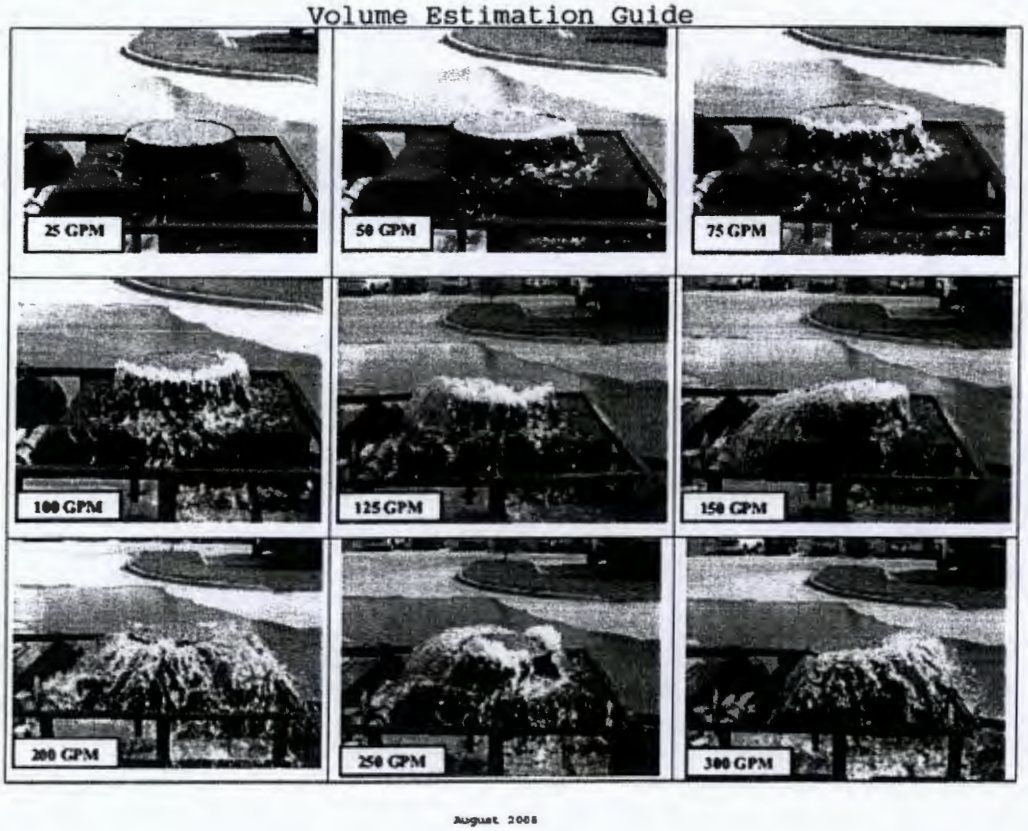
APPENDIX E: OVERFLOW VOLUME ESTIMATION PROCEDURES

Estimates of sewage discharged from the system will be initially estimated by the responding crew. Final estimates by the Utilities Director, City Engineer, or his/her designee will be used for reporting purposes. All estimates shall use one or more of the following methods:

1. Historic pump run times, pump discharge pressure, and pump H-Q curve;
2. Historic flow data;
3. Pipe size, slope, and depth of flow;
4. Calculations of estimated overflow from manhole (see example 1 below); and
5. Assessment of pooled SSO including dimensions of affected area (see example 2 below).

Example 1

Calculation of SSO Flow Rate Using Manhole



Example 2

Calculation of SSO Volume Using Dimensions of Affected Area

Rectangular Area Calculation Sheet for SSO Reporting

(Volumes from Chart are shown in Gallons per Inch Depth)

Width \ Length	5	10	20	30	40	50	60	70	80	90	100
5	16	31	62	94	125	156	187	218	249	281	312
10	31	62	125	187	249	312	374	436	499	561	623
15	47	94	187	281	374	468	561	655	748	842	935
20	62	125	249	374	499	623	748	873	997	1122	1247
25	78	156	312	468	623	779	935	1091	1247	1403	1558
30	94	187	374	561	748	935	1122	1309	1496	1683	1870
35	109	218	436	655	873	1091	1309	1527	1745	1964	2182
40	125	249	499	748	997	1247	1496	1745	1995	2244	2493
45	140	281	561	842	1122	1403	1683	1964	2244	2525	2805
50	156	312	623	935	1247	1558	1870	2182	2493	2805	3117
55	171	343	686	1029	1371	1714	2057	2400	2743	3086	3428
60	187	374	748	1122	1496	1870	2244	2618	2992	3366	3740
65	203	405	810	1216	1621	2026	2431	2836	3241	3647	4052
70	218	436	873	1309	1745	2182	2618	3054	3491	3927	4363
75	234	468	935	1403	1870	2338	2805	3273	3740	4208	4675
80	249	499	997	1496	1995	2493	2992	3491	3989	4488	4987
85	265	530	1060	1590	2119	2649	3179	3709	4239	4769	5298
90	281	561	1122	1683	2244	2805	3366	3927	4488	5049	5610
95	296	592	1184	1777	2369	2961	3553	4145	4737	5330	5922
100	312	623	1247	1870	2493	3117	3740	4363	4987	5610	6233
105	327	655	1309	1964	2618	3273	3927	4582	5236	5891	6545
110	343	686	1371	2057	2743	3428	4114	4800	5485	6171	6857
115	358	717	1434	2151	2867	3584	4301	5018	5735	6452	7168
120	374	748	1496	2244	2992	3740	4488	5236	5984	6732	7480
125	390	779	1558	2338	3117	3896	4675	5454	6233	7013	7792
130	405	810	1621	2431	3241	4052	4862	5672	6483	7293	8103
135	421	842	1683	2525	3366	4208	5049	5891	6732	7574	8415
140	436	873	1745	2618	3491	4363	5236	6109	6981	7854	8727
145	452	904	1808	2712	3615	4519	5423	6327	7231	8135	9038
150	468	935	1870	2805	3740	4675	5610	6545	7480	8415	9350
155	483	966	1932	2899	3865	4831	5797	6763	7729	8696	9662
160	499	997	1995	2992	3989	4987	5984	6981	7979	8976	9973
165	514	1029	2057	3086	4114	5143	6171	7200	8228	9257	10285
170	530	1060	2119	3179	4239	5298	6358	7418	8477	9537	10597
175	545	1091	2182	3273	4363	5454	6545	7636	8727	9818	10908
180	561	1122	2244	3366	4488	5610	6732	7854	8976	10098	11220
185	577	1153	2306	3460	4613	5766	6919	8072	9225	10379	11532
190	592	1184	2369	3553	4737	5922	7106	8290	9475	10659	11843
195	608	1216	2431	3647	4862	6078	7293	8509	9724	10940	12155
200	623	1247	2493	3740	4987	6233	7480	8727	9973	11220	12467
205	639	1278	2556	3834	5111	6389	7667	8945	10223	11501	12778
210	655	1309	2618	3927	5236	6545	7854	9163	10472	11781	13090
215	670	1340	2680	4021	5361	6701	8041	9381	10721	12062	13402
220	686	1371	2743	4114	5485	6857	8228	9599	10971	12342	13713
225	701	1403	2805	4208	5610	7013	8415	9818	11220	12623	14025
230	717	1434	2867	4301	5735	7168	8602	10036	11469	12903	14337
235	732	1465	2930	4395	5859	7324	8789	10254	11719	13184	14648
240	748	1496	2992	4488	5984	7480	8976	10472	11968	13464	14960
245	764	1527	3054	4582	6109	7636	9163	10690	12217	13745	15272
250	779	1558	3117	4675	6233	7792	9350	10908	12467	14025	15583

Total Spill Volume = _____ (Value from Chart) x _____ (Depth in Inches) = _____ (Volume in Gallons)

APPENDIX F: DISINFECTANT HANDLING AND RESPONSIBILITIES

Soil – In some cases (e.g., pipe replaced and backfilled with dirt) it may be acceptable to cover the affected area with clean relatively dry dirt. This will allow "natural" remediation of any organic residues of the SSO similar to the way a septic tank leach field system works, and will let the public immediately access the affected areas.

Lime – Lime or calcium oxide can be applied to ground surfaces where a SSO has occurred in an attempt to kill potential pathogens. Lime is chemically very basic. Lime can cause burns to human skin and injure eyes due to its basic characteristics. Product label and Safety Data Sheet instructions, as provided by the product manufacturer, should always be stored with the material and followed when applying lime. In some cases the area may have to be raked and lime reapplied.

High-Test Hypochlorite (HTH) – HTH is a form of calcium hypochlorite with a high concentration of chlorine – typically 65 to 70 percent. HTH can be applied in powder form or as a solution to ground surfaces where an SSO has occurred, but shall not be applied in areas where runoff to WoS is possible. The chlorine in HTH is a hazardous substance. In solution form it is highly corrosive and can cause burns to human skin and injure eyes. Product label and Safety Data Sheet instructions, as provided by the product manufacturer, should always be stored with the material and followed when applying HTH.

APPENDIX G: PUBLIC NOTIFICATION SIGNAGE

The responsibility for determining whether signage is necessary for areas affected by wastewater flows is determined by the Collection Operations Division Manager, WWMF Superintendent, or his/her designee. Personnel onsite should relay the information of the action being taken to the proper foreman, supervisor, and manager(s). Two main factors in determining when and where to post signs are the degree of public access and the effectiveness of the clean-up of the affected area. The posting of signage will not necessarily prohibit use or access to the area unless posted otherwise, but will provide a temporary warning of potential public health risks associated with the recent SSO (e.g., heavy flushing of an area making it impractical to recover all of the wash down water commingled with wastewater). For most SSOs in the collection system, the first responders, in consultation with the Collection Operations Division Manager or his/her designee, will make the decision regarding posting.

If the decision to post has been made regarding SSOs to surface waters, ground surfaces, or structures and there is concern if the notification is sufficient, then the City Manager or Utilities Director should be involved and additional public notifications may be necessary. Circumstances under which additional public notification may be considered include, but are not limited to, the following:

1. When permanent repairs to resolve a SSO will take a period of time (e.g., an estimated 24-48 hours) and the reduction in the usage of water in homes or business would assist in managing the operation of the locally affected pipeline, pumping station, or wastewater plant.

2. When a more permanent repair or replacement is needed to prevent recurrence and the actions will take a period of time (e.g., an estimated 24-48 hours) and citizens need to be advised of repair schedules and possible traffic detours in the vicinity of the repairs (e.g., pumping station and bypass operation, pipeline crossing road way, and so on).

Examples of signage and door hangers are included on the following pages.

Signage Example:

CAUTION:
SANITARY SEWER
OVERFLOW SITE

The City of Florence has
experienced a sewer
overflow in this area.

AVOID CONTACT, KEEP
CHILDREN AND PETS AWAY.

For information regarding
this overflow, call the
City of Florence Utilities
Department at 843-665-3236.

Door Hanger Example:

NOTICE

SANITARY SEWER OVERFLOW

The City of Florence has experienced an overflow in your area.

A sewer backup has occurred on _____,
(date)

in this neighborhood at _____.
(location)

This means that water containing sewage may have entered your yard or _____.
(receiving water body)

Check your yard and stream/ditch and call **843-665-3236** if you find sewage in your yard. Do not try to clean it up yourself. Call the City of Florence Utilities Department for assistance and instructions at the number above. Please avoid contact with standing water, drainage ditches or nearby streams, as it may contain sewage and stormwater runoff contaminants that could make you sick.

KEEP CHILDREN AND PETS AWAY!

APPENDIX H: PRESS RELEASE EXAMPLES

Example 1

Press Release Language- SSO Still Occurring

City of Florence Issues a
Sanitary Sewer System Overflow Notification
To
The Customers of
(Cashua Drive / 2nd Loop Road Area)

September 25, 2013

The City of Florence has experienced an overflow of sanitary sewer in the area behind the 2500 Block of 2nd Loop Road located in Florence County.

The City of Florence's Utilities Department was notified approximately at 3:30 pm on 09/24/13 of a sanitary sewer overflow. The City experienced flooding due to heavy rainfall in the collection system line at the above location. As a result, sanitary sewer was introduced into Jeffries Creek.

The City of Florence's Utilities Department can be reached at 843-665-3236 and can answer other inquiries concerning this Notification.

Example 2

Press Release Language- SSO Under Control

City of Florence Issues a
Sanitary Sewer System Overflow Notification

To
The Customers of
(Cashua Drive / 2nd Loop Road Area)

September 25, 2013

The City of Florence has experienced an overflow of sanitary sewer in the area behind the 2500 Block of 2nd Loop Road located in Florence County

The City of Florence's Utilities Department was notified approximately at 10:00am on 09/24/13 of a sanitary sewer overflow that lasted until 12:30pm on 09/24/13 due to vandalism to the collection system line at 2501 2nd Loop Road. As a result, sanitary sewer was introduced into Jeffries Creek. The City has cleaned the sewer line and washed the storm drain including the creek.

The City of Florence's Utilities Department can be reached at 843-665-3236 and can answer other inquiries concerning this Notification.

APPENDIX I: LOCAL PRINT AND BROADCAST MEDIA ENTITIES

A list of local print and broadcast media to be notified of an SSO by the City Manager, Utilities Director, or his/her designee is provided below.

Local Television Stations:

WMBF TV 32
- Alisha Laventure alaventure@wmbfnews.com
- Ken Baker kbaker@wmbfnews.com

WBTW TV 13
- Bob Juback bjuback@wbtw.com
- Eric Walters ewalters@wbtw.com
- Nick Sturdivant nsturdivant@wbtw.com
- Patricia Burkett pburkett@wbtw.com

WPDE TV 15
- Allyson Floyd allyson@wpde.com
- Billy Huggins wlhuggins@wpde.com

Local Print Media:

Morning News
- Don Kausler dkausler@florencenews.com
- Gavin Jackson gjackson@florencenews.com
- Kimberly Brauss kbrauss@florencenews.com
- Matt Tate mtate@florencenews.com
- Traci Bridges tbridges@florencenews.com

Florence News Journal
- Brenda Harrison bharrison@florencenewsjournal.com
- Lannis Coleman lcolemannewsj@hotmail.com

Golden Life
- Chad Buffkin gldnlife@bellsouth.net

Community Times
- Dianna Smith dsmith7716@aol.com
- Rashima Smith rsmith3114@aol.com

APPENDIX J: STORMWATER BEST MANAGEMENT PRACTICES (BMPs)

1. Stop the discharge as quickly as possible.
2. Do not pump sewage back-ups, disinfectant or disinfected sewage into streets, storm drains, ditches or surface waters.
3. Before any digging begins, inlets in the immediate downstream area of the primary event location must be protected with sand bags, gravel bags, sediment tubes, or a combination of the three. Also protect any sensitive areas nearby including wetlands, adjacent waters, or other conveyance structures.
4. When a backup occurs and when disinfecting the contaminated area, take every effort to ensure that sewage, disinfectant and disinfected sewage is not accidentally discharged into a storm drain or ditch. Methods may include: (a) Blocking storm drain inlets and catch basins with gravel bags, sand bags, sediment tubes, or a combination of these items. (b) Containing and diverting sewage, sediment and disinfectant away from open channels and other storm drain fixtures. (c) Removing the solid material with vacuum equipment.
5. Do not clean tools or equipment in or near surface waters or over storm drains or ditches. If rinsing a sand bag or sediment tube for reuse, rinse over a vegetated area so the runoff can infiltrate.
6. When activities are complete, inspect the flow path of the discharge. Identify any areas that may have experienced soil erosion and need repair. Use erosion control blankets, mulch or geo-fabric with hay matting (which can include seeds) to stabilize soil erosion. Always make every attempt to re-establish vegetation on the impacted area, and if necessary continue inspections until the area has stabilized. Contact the Compliance Section with any questions or help with ongoing inspections or stabilization issues.
7. With backhoes, shovels or brooms, remove any dirt or sediment on impervious surfaces. If necessary, contact the Collection Operations Division for use of a street sweeper.
8. Do not hose down the area to remove sediment (unless it is necessary for traffic safety).

Required Structures and Equipment – The Wastewater Treatment Division will procure the following BMPs and equipment to accomplish the procedures listed above. Equipment may be stockpiled offsite, and needed quantities will be stored in the crews' response vehicles.

- # 57 stone
- Sand
- Geotextile fabric bags (can be used with stone and sand)
- Sediment tubes
- Silt fence
- Backhoe (for sediment removal)
- Brooms and shovels

APPENDIX K: CITY GUIDELINES FOR SEWER BACKUP CLAIMS

The City of Florence maintains liability insurance coverage with the South Carolina Municipal Insurance and Risk Financing Fund (SCMIRF) through the South Carolina Municipal Association. When responding to and investigating a Building Backup report, City personnel shall recommend that the customer arrange for cleanup as soon as possible to prevent further damage. At no time should any employee indicate fault or responsibility for damages. The general procedures to follow for filing a claim are as follows:

1. City employee advises the citizen to contact the Risk Management Division at 324 West Evans Street or by calling 843-665-3231.

2. The Risk Management staff will provide the citizen with the appropriate claim form and ask that two repair estimates be submitted along with the completed form.

3. The incident will be investigated by Utilities Department and Risk Management staff.

4. All information from the claim, including the claim form, estimates, investigation documentation, photos, and any other related information will be submitted to the insurance carrier.

5. The insurance carrier will notify the claimant of receipt of the claim and speak with them for additional information.

6. Any inquiries by the claimant are to be directed to the insurance carrier.

7. The insurance carrier will make the determination as to whether or not the claim is accepted under conditions of the City of Florence policy. The insurance carrier will notify claimant in written form.

APPENDIX L: CHRONIC OVERFLOW LOCATIONS LISTING

The City of Florence SSS does not contain any Chronic Overflow Locations at this time. Upon such a time that any location(s) begin to meet the criteria for consideration as defined in Section 1.3.1, the SORP shall be updated to include such location(s).

APPENDIX M: EMERGENCY CONTRACTORS LIST

A list of emergency contractors, including contact information, is maintained by the Utilities Department and is provided below. Contractor services will be obtained through the City's Emergency Procurement Procedure as outlined in Appendix N. The identified emergency contractors have been evaluated and determined to be qualified to provide emergency bypass-pumping services as well as repair and replacement construction services for gravity sewers, manholes, force mains, pump stations, and related appurtenances.

Tommy Dixon
Dixon Construction Company
P.O. Box 210
Bennettsville, SC 29512
(843) 479-4831

Sam Hickson
Four S Construction, Inc.
834 Cane Mill Crossing Road
Cheraw, SC 9520
(843) 921-1885

Ed Davis
North American Construction Company, Inc.
P.O. Box 15088
Quinby, SC 29506
(843) 665-6746

Randy Pigate
Randy Pigate Construction Co., Inc.
P.O. Box 317
Longs, SC 29568
(843) 399-0045

Wade Finklea
RWF Construction, LLC
P.O. Box 69
Effingham, SC 29541
(843) 662-4109

APPENDIX N: EMERGENCY PROCUREMENT PROCEDURE

The City of Florence's Emergency Procurement Procedure is defined in the City's Purchasing and Contracting Policies and Procedures Manual. The procurement process, as defined in the manual, is as follows:

> Emergency purchases should be avoided whenever possible through proper planning. An emergency may be defined as an "unforeseen occurrence requiring prompt and immediate action." An emergency may also include situations in which life, safety, and welfare of the citizens of Florence are in danger, necessitating emergency construction work such as, but not limited to, repairs to a sewer line, repairs to a water well pump, etc. For emergency purchases or contracts exceeding $8,000, the Department Director must request authorization from the City Manager, utilizing the Purchase Approval Form, to waive the City's formal bid procedures. Such emergency purchases or construction may then be executed immediately upon approval.

For emergency purchases or contracts less than $8,000, the Purchase Approval Form is not required and services or construction can be executed immediately by the Division or Department Manager. For emergency purchases or contracts exceeding $8,000, the Purchase Approval Form is completed in conjunction with the procurement of emergency contractor services. The timeline for approval and execution of the services follows.

1. City crew responds to a reported SSO, assesses the site, and determines the situation requires the support of an outside contractor.
2. City crew(s) begin to mitigate and contain the SSO in accordance with the procedures outlined in Section 3.3.
3. The emergency contractors listed in Appendix M are notified of the SSO condition and arrive at the SSO site to determine the scope of work required to correct the situation.
    a. If the SSO occurs during business hours, emergency contractors and the City will meet onsite during the same business day to assess the situation and determine the scope of services required to correct the SSO.
    b. If the SSO occurs during non-business hours, emergency contractors and the City will meet onsite during the next business day to assess the situation and determine the scope of services required to correct the SSO.
4. Following the onsite review and meeting, the emergency contractors present will submit bids for the required work to the City within 24 hours. City personnel will complete the Purchasing Approval Form in advance of receiving bids from the contractors.
5. Following receipt of bids from the emergency contractors, the City will select the lowest bid and execute the selection of a contractor to perform the selected services.
6. The selected contractor will begin the required corrective actions as soon as possible following selection, but in no case shall the work begin later than the next day.
7. City personnel remain responsible for the control and containment of the SSO, in accordance with the procedures provided in Section 3.3, until the emergency contractor has completed the corrective actions required to eliminate and correct the SSO condition.

A copy of the City's Purchase Approval Form is provided on the following page.

City of Florence Purchase Approval Form

City of Florence, SC

Purchase Approval Form

Instructions

1. This form must be completed for all purchases of $8,000 or more, including purchases from the Equipment Replacement Fund. The following exceptions shall apply:

   A. Routine restocking of inventories such as gasoline, diesel fuel, tires, tubes motor oil, hydraulic oil, automatic transmission fluid, and waterworks material and supplies (e.g., gate valves, water and sewer pipe, fire hydrants, line setters, meters, meter boxes, water meters, etc.)

   B. Progress payments on contractual obligations, such as construction contracts, professional services, contracts, etc.

   C. Monthly utility payments, rental or lease payments or payments for City-County Complex Operations.

2. This form should be completed and signed by the Division Manager, Department Manager, Department Director, Finance Director and the City Manager. **This form will then be forwarded to the Purchasing Agent for formal processing of the approved purchase.**

3. If this is a request for an **Emergency Purchase,** please indicate in the space provided below and attach proper explanation and justification. If the emergency purchase is approved by the City Manager, the formal bidding process may be waived. The requesting Department must coordinate the emergency purchase with the Purchasing Agent and the Department Director must work with the Purchasing Agent so that the best possible price is obtained.

Purchase Information

Department:_____ Division:_____

Approximate Cost:_____ Date:_____

Appropriated in Current Year Budget: ☐ Yes ☐ No Account Number:_____

Emergency Purchase ☐ Yes ☐ No If yes, please attach explanation/justification

Description of Purchase

_____

_____

_____

_____

_____

Approval Signatures

Division Manager: _____ Date:_____

Department Manager: _____ Date:_____

Department Director: _____ Date:_____

Finance Director: _____ Date:_____

City Manager: _____ Date:_____

Form.FI-0503/13

APPENDIX O: LABORATORY SOP – FECAL COLIFORM TESTING

The City of Florence conducts bacteriological testing at SSO sites in accordance with the protocols established by the City's Laboratory SOP for Fecal Coliform Testing. A copy of the SOP is provided as follows:

H. THERMOTOLERANT (FECAL) COLIFORM MEMBRANE FILTER PROCEDURE

Method: **SM 9222D** 2006 Revised January 2, 2013

Overview:

The membrane filter procedure is what the City of Florence Waste water Treatment laboratory use to define the fecal component of the coliform group. Because the incubation temperature is critical, a plastic waterproof bag is used to submerge the culture (sample) in a water bath at an elevated temperature for 24 hours +/- 2 hours. The thermotolorent coliform MF procedure uses an enriched lactose media and incubation temperature of 44.5 +/- 0.2^0 C. Coliform organisms from other sources often cannot produce gas under these conditions.

Upon collection of sample, an eight (8) hour window is used for transportation as well as process and start incubation time in water bath.

Note: Traveling time for fecal sample to plant should not exceed six hours. Once in the laboratory the sample has a two hour processing time frame. Revised 08/20/2009

Note: Before this revision, samples had up to eight hours to process with no significance on lab time.

Apparatus:

50 millimeters (mm) x 9 mm petri dishes
Gast vacuum pump
Bushner funnel
Vacuum flask
5.5 centimeters (cm) membrane filters
Fisher stereo zoom microscope
Nasco sterilized whirl-pak bags containing sodium thiosulfate
Nasco sterilized sealing bags
3 mm inoculating loop
2540 M Brinkman autoclave
Precision water bath incubator
Blue M air incubator
115 V Fluorescent illuminator

Reagent:

1. Phosphate Buffer solution: Lab prepared phosphate buffer solution using magnesium chloride and potassium di-hydrogen phosphate pillows per 1 L of de-ionized water.
2. Membrane media: Commercially prepared fecal coliform medium (m-FC) ml.
3. Differentiation media: Laboratory prepared lauryl tryptose broth tubes.
4. Verification media: Laboratory prepared EC medium tubes.

Procedure:

1. Using the 300 ml bag with sodium thio-sulfate tablets, get fecal sample from designated effluent area near weir. Approximately six to eight feet from actual run off. Record date time and temperature on Chain of Custody sheet. Bring sample back to lab for analysis. Record date, time, and temperature at lab. Use sample volume which will yield fecal counts between 20 and 60 fecal coliform colonies per membrane. Sample volumes of 10ml, 50ml and 100ml are to be filtered onto a 0.45um membrane filter (MF). Sample volume may be altered to meet recommended yield count. The volume shall not exceed 100 mls.
2. Using sterile forceps, by burning over Bunsen burner, place a sterile membrane filter (grid side up) over porous plate of funnel. The funnel separates at the base to allow filter to slide onto receptacle. The funnel should be locked in place before any liquids of any kind is poured.
3. Three funnels should be used during analysis. The first one is for the 100ml phosphate buffer solution filtration to start the process. The second funnel is used for the 10ml, 50ml and 100ml sample filtration process. The third and last funnel is for the 100ml phosphate buffer solution to end the process. This process is known as cross contamination testing.
4. A sterile membrane filter must be used in each filtration process. Sterile graduated cylinders must be used in the measurements of each sample. Commercially pre-sterilized pads within petri dish are what the membrane filters are stored in during incubation.
5. Pour 2.0 mls of m-FC medium on sterilized pads within the petri dish. Allow medium to soak into the pad. After filtration of the prepared filter, place prepared filter directly on saturated pad and invert dish. Each dish should be marked with (N) for negative control, containing the buffer solution, 10, 50, and 100 milliliters of effluent sample used in each dish, and (B) for blank containing the buffer solution ending the process.
6. Using your Nasco sterilized bags, seal the petri dish cultures in the waterproof bags by inverting the dishes in the bag and secure tightly.
7. Submerge the bag into the water bath incubator with grid pads downward and incubate for twenty-four hours +/- two hours at 44.5^0 C +/- 0.2^0 C. Using the steel frame inside the bath to anchor petri dishes below water surface, keep samples at constant temperature. It is crucial to maintain temperature. There should be limited time elapsed between preparation and cultures submerge in water bath. Thirty minute maximum time suggested.

Counting Fecal Results

Colonies produced by fecal coliform bacteria on m-FC medium are various shades of blue. Pale yellow or brownish colonies may be atypical E. coli. Non fecal coliform colonies will be observed on m-FC medium because of selective action of the elevated temperature. Count colonies with a low-powered (10 to 15 magnifications) binocular wide field dissecting microscope with the aid of a fluorescent illuminator.

1. Remove the petri dishes containing the sample pads once the twenty-four hour period has elapsed, plus or minus two hours.
2. Count the number of isolated blue coliform present on each pad.
3. Record number on Fecal Report Form.
4. Multiply the #10 labeled plate by ten, #50 labeled plate by two, and #100 labeled plate by one to indicate count per one hundred milliliters sample. Sum and divide by three to get a reportable count.
5. If the #10 & #50 labeled plate count do not reach a count of twenty (20), they should not be part of the total count reported.
6. Any atypical coliform should be counted in designated slots for atypical results. Monthly analysis should be performed to determine origin of all coliform results.
7. Compute the density from the sample quantities that produced membrane filter counts within the desired range of 20 to 60 fecal coliform colonies. This colony density is more restrictive than the 20 to 80 total coliform range because of larger colony size on m-FC medium. Record densities of fecal coliform per 100 mls.
   (fecal) coliform colonies/100mls = coliform colonies counted x 100ml sample filtered.

Reportable results are based on filters that have 20 – 60 fecal coliform colonies. If 100 mL of sample results in a colony count of greater than 60,and the previous plates are out of range also, the result reported to the State must be listed as >60. Only filters with 20 – 60 fecal coliform colonies are to be used for reporting results to the State.
Examples of situations and counting procedures are as follow:

D H E C

PROMOTE PROTECT PROSPER

South Carolina Department of Health and Environmental Control

Counting Rules for Membrane Filtration Methods for Coliform Bacteria

NOTE: The following examples in this document pertain only to fecal coliforms, although the rules are applicable to total coliforms as well.

1.0 General Information and Equation

Select the membrane filter with the number of colonies in the ideal counting range and report as count per 100 mL according to the general formula:

CFU/100 mL = (# of colonies counted ÷ sample volume filtered in mL) x 100
(CFU = colony forming units).

2.0 Colony Counts Within the Ideal Counting Range

The ideal range of colonies that are countable on a membrane filter depends on the method and/or regulatory guidelines. An ideal range of 20-60 colonies is used for fecal coliform testing, and an ideal range of 20-80 colonies is used for total coliform methods.

Example 1: Sample volumes of 15, 5, and 2 mL produced colony counts of 110, 40, and 10 respectively. Which filter(s) should be chosen to calculate results? The 5 mL sample dilution produced a colony count of 40, which falls in the 20 - 60 ideal range. Since results are reported on a 100 mL sample scale, (see section 1.0 above), the reportable result would be calculated using the (40 ÷ 5) x 100 = 800 CFU/100 mL.

3.0 More Than One Count in the Ideal Range

If more than one filter has ideal colony counts, carry results to reporting units, and then average the results to arrive at final reporting value.

Example 2: Sample volumes of 75, 50, 25, 10, and 1 mL yield colony counts of 100, 59, 26, 12, and 2, respectively. The 50 mL and 25 mL sample dilutions yield colony counts in the required range. Calculate each to a final result: (59 ÷ 50) x 100 = 118; (26 ÷ 25) x 100 = 104. Then average the results: (118 + 104) ÷ 2 = 111 CFU/100 mL.

Example 3. The same rule applies if two replicates are analyzed that meet the ideal range. If replicate 50 mL dilutions result in colony counts of 24 and 36 colonies, the results would be: (24 ÷ 50) x 100 = 48 and (36 ÷ 50) x 100 = 72. Take the average of the two results to arrive at final reportable result: (72 + 48) ÷ 2 = is 60 CFU/100 mL.

4.0 All Counts Below the Lower Ideal Range

When all counts are below the lower ideal range, select the most nearly acceptable count and report as an estimated count.

Example 4. Sample volumes of 75, 50, and 25 mL produce colony counts of 15, 9, and 6. Select the most nearly acceptable count and report as an estimated count. Thus, the reportable result is (15 ÷ 75) x 100 = 20 CFU/100 mL.

Example 5. Sample volumes of 100, 10 and 1 mL produce colony counts of 17, 1, and 0, respectively. Since a 100 mL volume was filtered report that value as 17 CFU/100 mL. Note: It is not an estimate due to the 100 mL sample volume.

5.0 All Counts Above the Upper Ideal Range

When all MF counts are above the upper ideal range but < 200 total colonies, calculate results using the smallest volume filtered and report as an estimated value.

Example 6. Sample volumes of 10, 5, and 2 mL produce colony counts of TNTC (Too Numerous to Count), 196, and 90. Since all are above the ideal range, calculate estimated result based on smallest volume filtered: (90 ÷ 2) x 100 = 4,500 CFU/100 mL.

Example 7. Sample volumes of 10, 1 and 0.1 mL produce colony counts of TNTC, TNTC, and TNTC. Use the upper ideal range (60 for fecal coliforms) with the smallest volume (0.1 mL) and calculate the result: (60 ÷ 0.1) x 100 = >60,000 CFU/100 mL.

6.0 Counts Above and Below the Ideal Range

When MF counts are above and below the reporting range, select the most nearly acceptable count to the ideal range.

Example 8. Sample volumes of 90, 10 and 1 produce colony counts of 62, 12, and 1. Since the 62 colony count is the most nearly acceptable value, use it to calculate the result: (62 ÷ 90) x 100 = 69 CFU/100 mL. This would be reported as an estimated count of 69 CFU/100 mL.

Example 9. Sample volumes of 90, 10, and 1 mL produce colony counts of 180, 18, and 2. Select the count closest to the ideal colony count range. This would be 18 and calculate the estimated result:
(18 ÷ 10) x 100 = 180 CFU/100 mL.

7.0 Miscellaneous Examples (Including 100 mL Sample Results)

The ideal range for colony counts on a filter, e.g., 20 - 60 for fecal coliforms under the CWA, takes precedence over any other counting rule.

Example 10. Sample volumes of 100, 10 and 1 produce colony counts of 165, 39, and 18. Since the colony count for the 10 mL dilution meets the ideal range of 20 – 60, it must be used to calculate the result: (39 ÷ 10) x 100 = 390 CFU/100 mL. Even though a 100 mL portion was filtered, it did not meet the ideal range and cannot be used as the reportable result, because a filter meeting that range is available.

Example 11. Sample volumes of 100, 10 and 1 produce colony counts of 100, 19, and 2. Since the colony count for the 10 mL dilution is the most nearly acceptable to the range of 20 – 60, it must be used to calculate the result: (19 ÷ 10) x 100 = 190 CFU/100 mL. This would be an estimated result. Even though a 100 mL portion was filtered, the colony count for the 10 mL sample dilution is closer to the ideal range and thus, must be used as the reportable result.

7.1 Membranes with no colonies present. These results will be reported as less than values.

Example 12. Sample volumes of 10, 5, and 1 mL produce colony counts of 0, 0, and 0. Insert 1 colony into the general equation using the largest volume and calculate result: (1 ÷ 10) x 100 = 10. This would be reported as a less than value, i.e., < 10 CFU/100 mL.

7.2 Colony counts based on a sample volume of 100 mL filtered. This result will be an actual value, not an estimated value.

Example 13. A sample volume of 100 mL is filtered and produces 6 colonies. The result would be 6 CFU/100mL.

Questions concerning these rules can be addressed by contacting the Office of Environmental Laboratory Certification at 803-896-0970.

Fecal Coliform Verification

Laboratory analyst must verify fecal coliform colonies grown on a plate using M-FC medium. Wastewater effluent is tested for fecal coliform bacteria as part of NPDES permit requirements. Because a fecal coliform count is required for these test colonies suspected of being fecal coliform origin must be verified individually.

The verification procedure is a two-step process. The first step is the presumptive test. Use lauryl tryptose broth (LTB) for the presumptive portion of the test. Add 35.6g of dehydrated lauryl tryptose broth to 1 liter of de-ionized water in a beaker. Mix broth thoroughly and heat slightly to dissolve completely. Using fermentation tubes with inverted vial, add ten milliliters of LTB to each fermentation tube. Close with heat resistant plastic caps. Sterilize by autoclave at 121^0 C for 15 minutes. Incubate tubes at 35^0 C +/- 0.5 and allow at least 24 hours before use.

The LTB tubes are inoculated with an isolated colony from the petri dish. Using a sterile inoculating loop, scrape an isolated blue colony from the petri dish to the tube. Swirl around gently. Use five different isolated blue colonies for this procedure. If other colors are present,

transfer a representative number of each atypical colony to a fermentation tube to be analyzed. Incubate these tubes into an incubator at 350 C +/- 0.5 for 24 hours +/- 2 hours. Examine the tubes for heavy growth, gas, or acidic reaction (shades of yellow color). This would constitute a positive reaction and tubes should be prepared for the confirm phase. If not reaction has occurred, re-incubate and re-examine tubes at the end of 48 hours +/- 3 hours.

Production of gas or acidic growth within 48 hours +/- 3 hours constitutes a positive presumptive reaction. These inoculations should be transferred to the confirm phase.
Absence of acidic growth or gas formation at the end of 48 hours +/- 2 hours of incubation, this will constitute a negative reaction. Thus test complete and tubes should be disposed of using proper procedures.

The second step of the verification phase is the conformation phase. All positive reactions from the presumptive phase should be tested or confirmed. The EC medium is used to determine positive results to fecal origin.

To prepare the tubes, measure 37.0g of dehydrated EC medium in dish and add to 1 liter of de-ionized water in a large beaker. Mix the solution thoroughly and heat slightly to dissolve the completely. Using fermentation tubes with inverted vial, add ten milliliters of liquid EC medium to each fermentation tube. This can be measured accurately with ten milliliter volumetric pipettes. Close tube with heat resistant plastic caps. Sterilize by autoclave at 121^0 C for 15 minutes. Incubate tubes at 35^0 C +/- 0.5 and allow at least 24 hours before use.

Using a sterile inoculating loop, insert the loop into the positive tube from the presumptive test and transfer a sample to the EC medium tube. Swirl around gently. Repeat for all other positive presumptive tubes. After a sample from the positive LTB tubes have been transferred to tubes of EC medium, the tubes are incubated in a water bath at 44.5^0C +/- 0.2^0 C for 24 hour. Tubes of EC medium must not be incubated longer than 24 hours.

Production of gas or acidic growth after 24 hours +/- 2 hours constitutes a positive reaction. The confirm phase is now complete.

Please be reminded that proper temperature control is essential to the success of the fecal coliform confirmation procedure. For this reason, the level of water in the bath must extend beyond the level of the media in the EC tubes by at least one quarter inch. It is also imperative that once inoculated, the EC tubes are placed in the water bath within thirty minutes to discourage the growth of any coliform of non-fecal origin and/or background microorganisms that may be present.

Adjusted Colony Counts

During the colony verification process, the analyst may learn that some colonies that have been classified as atypical may indeed be total or fecal coliform bacteria. In these cases, the atypical colonies should be counted as such. As stated earlier, the analyst is required to select (at random) at least five typical colonies and at least on colony from each atypical morphological type. Note that the analyst should verify more colonies of a morphological type if there is an

abundance of these colonies. Also note that adjusted counts can only be done on plates from which colonies have been verified.

To perform an adjusted count, determine the percent of colonies verified as total coliform or E. coli for each morphological type (typical or atypical). Use this percent figure to adjust the reported coliform count per 100 ml. Calculate this by dividing the number of colonies which produce positive results by the number of colonies tested for each type. Multiply this value by the total number of colonies of that type.

For example, a plate may have 30 blue colonies w/sheen; 15 atypical pint colonies, and 10 atypical brown colonies. All five beige verified produce gas in LTB and EC. While two of the three pink colonies verified produce gas in LTB and EC. Neither of the brown colonies produced gas in EC medium. The final adjusted count would be

Description + Colonies	***# tested***		***# of colonies each type***		***Adjusted #***
Beige w/sheen	5/5	*	5	=	30
Pink	2/3	*	15	=	10
Brown	0/2	*	10	=	0
Total adjusted count					40

Although it is required that the analyst , at a minimum, perform colony verification at least once each month, it is the responsibility of the analyst to perform verifications more frequently if previous verifications show that typical colonies are not total coliform and/or that atypical colonies produce gas in LTB and EC medium.

Revised 07/22/2011 mgc

APPENDIX P: CONTACT INFORMATION

Agency	Office Phone	Other/Comments
City of Florence Police Department	843-665-3191 *(24-hr Dispatch)*	911 *(Emergency)*
City of Florence Fire Department	843-665-3231	911 *(Emergency)*
City of Florence Office of the City Manager	843-665-3113	
City of Florence City Engineer	843-665-2047	
City of Florence Utilities Department	843-665-3236	
City of Florence Engineering Department	843-665-2047	
City of Florence Collection Operations Division	843-665-3236	
City of Florence Wastewater Treatment Division / WWMF	843-665-3240	843-629-6388 *(WWTP Pager)*
City of Florence Compliance Section	843-665-3236	
City of Florence Public Works Department	843-665-3236	
City of Florence Water Production	843-665-3271	
City of Florence Risk Management	843-665-3231	
Florence County Sheriff's Dept.	843-665-2121	911 *(Emergency)*
SCDHEC Pee Dee Region EQC Office	843-661-4825	888-481-0125 *(After-Hours)*

APPENDIX Q: EQUIPMENT LIST

Sewer Blockage, Broken or Collapsed Line

Minimum Emergency Equipment	**Specialized Equipment**
Jet flushing unit	Television camera unit
Rodding machine & associated cleaning/cutting attachments	Truck with hoist
Standard disinfectants	Vactor unit
Safety Equipment	Power saw (circular)
Air blower with hose	Power vacuum
Portable pumps	Pipe cutter (hydraulic)
Portable generators	Caution tape
Safety cones/barricades	Assorted hand tools (i.e., screwdrivers, wrenches, hammers, brooms)
Air Detector – for oxygen deficient, explosive or toxic gases	Swap loader trucks, septic tank skids, dewatering boxes, debris boxes
Confined space entry tripod and associated equipment	ROW clearing equipment, Shin cutter, skid steer mulchers, Mini-excavators, skid steer bucket
Personal Protective Equipment (PPE)	Lowboy tractor & trailer (transport equipment)
Safety harness and lifeline if applicable	Rubber tire/ Track excavators, dump trucks

Pump Station Failure

Minimum Emergency Equipment	**Specialized Equipment**
Vactor Unit	Aluminum ladder
Truck with hoist	Power vacuum
Standard disinfectants	Pipe cutter (hydraulic)
Safety Equipment	Caution tape
Air blower with hose	Bypass pumping equipment
Safety harness and lifeline if applicable	Assorted hand mirrors
Portable pumps	Bucket with rope
Portable generators	Aluminum ladder
Safety cones/barricades	Trash pumps may be required
Air Detector – for oxygen deficient, explosive or toxic gases	Assorted hand tools (i.e., screwdrivers, wrenches, hammers, brooms)
Confined space entry tripod and associated equipment	
Flashlight	
Personal Protective Equipment (PPE)	

AECOM

MEMORANDUM

To: Suzanne Armour, EPA, David Phillips, EPA, Glenn Trofatter, SCDHEC, and Paula Brown, SCDHEC EQC

From: Shelby Ozburn LeBron, P.E.

Date: March 4, 2015

Subject: Timmonsville WWTP Headworks Update

Project: 46423366

The Town of Timmonsville's WWTP headworks was updated based on the updated NPDES permit issued by SCDHEC effective on December 1, 2014. As required in the permit's schedule of compliance, the headworks was updated including a reevaluation of industrial allocations. A pretreatment questionnaire from Honda is included in the submittal as well as a draft Industrial User Permit. The City of Florence conducted domestic sampling in the Town of Timmonsville's collection system for the following parameters:

- Cadmium
- Copper
- Cyanide
- Lead
- Mercury
- Silver

The City utilized the results from the domestic sampling to determine the domestic loading for the system. EPA domestic concentrations were utilized for the remaining parameters. Textbook values were utilized in the DHEC pretreatment loading spreadsheet, which was utilized for the maximum allowable headworks loading (MAHL) to the WWTP. As illustrated in the Timmonsville headworks loading page, the monthly average MAIL for cadmium is a negative value. The monthly average and daily maximum MAILs for silver are also negative. Honda is a categorical discharger with categorical limits for both cadmium and silver. Influent and effluent WWTP data was collected to determine if a site specific removal efficiency could be used to aid in providing additional loading, but the influent and effluent results were all below detection. The MAHL are restricted based on the receiving stream. Therefore, the PQL for cadmium and silver were utilized as the permit limits, since there was not any MAIL available.

AECOM
101 Research Drive
Columbia, South Carolina 29203
Phone: (803) 254-4400
Fax: (803) 771-6676

HONDA OF SOUTH CAROLINA MFG., INC.'S

DISCHARGE PERMIT APPLICATION
WASTEWATER SURVEY QUESTIONNAIRE

SUBMITTED APRIL 2014

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HONDA Honda of South Carolina Mfg., Inc.	Honda of South Carolina Mfg., Inc 1111 Honda Way Timmonsville, SC 29161 April 2014	BLUE SKIES FOR OUR CHILDREN

HONDA OF SOUTH CAROLINA MFG., INC.'S

DISCHARGE PERMIT APPLICATION
WASTEWATER SURVEY QUESTIONNAIRE

SUBMITTED APRIL 2014

DISCHARGE PERMIT APPLICATION
WASTEWATER SURVEY QUESTIONNAIRE

SECTION A - GENERAL INFORMATION

A.1. Company name, mailing address, and telephone number:

Honda of South Carolina Mfg., Inc.

1111 Honda Way

Timmonsville, SC

Zip Code 29161 Telephone No. ( ) 843-346-8000

A.2. Address of production or manufacturing facility. (If same as above, check X.)

Zip Code _____ Telephone No. ( ) _____

Tax Map Number _____

Note to Signing Official: In accordance with Title 40 of the Code of Federal Regulations Part 403 Section 403.14, information and data provided in this questionnaire which identifies the nature and frequency of discharge shall be available to the public without restriction. Requests for confidential treatment of other information shall be governed by procedures specified in 40 CFR Part 2. Should a discharge permit be required for your facility, the information in this questionnaire will be used to issue the permit.

This is to be signed by an authorized official of your firm after adequate completion of this form and review of the information by the signing official.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fines and imprisonment for knowing violations.

Authorized Representative: Steven Rath / Assistant Vice President

Type or Print Name / Title

4/17/2014 Steven W. Rath

Date Signature